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TOMORROW'S MANPOWER NEEDS

National manpower projections and a guide
to their use as a tool in developing State
and area manpower projections

VOLUME II,
NATIONAL TRENDS AND OUTLOOK:
INDUSTRY EMPLOYMENT AND OCCUPATIONAL STRUCTURE

BULLETIN NO. 1606

U.S. DEPARTMENT OF LABOR
BUREAU OF LABOR STATISTICS

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PREFACE

This is the second of four volumes of *Tomorrow's Manpower Needs*, a publication devoted to the subject of national, State and area projections of manpower requirements. The full series of volumes is as follows:

I Using National Manpower Data to Develop Area Manpower Projections

II National Trends and Outlook: Industry Employment and Occupational Structure

III National Trends and Outlook: Occupational Employment

IV The National Industry–Occupational Matrix and Other Manpower Data

The objective of this publication is to help fill a gap in manpower information best described by President Johnson in his 1964 Manpower Report to Congress, "Projections of probable need in particular occupations are an essential guide for education, training, and other policies aimed at developing the right skills at the right time in the right place." Projections of occupational needs at the State and area levels are needed in planning education and training programs. To help meet this need, *Tomorrow's Manpower Needs* presents up–to–date national manpower projections and provides a guide to their use in developing State and area manpower projections. This publication will be used in conjunction with a campanion publication, *Handbook for Projecting Manpower Requirements and Resources for States and Areas,* prepared by the Bureau of Employment Security, Manpower Administration, U.S. Department of Labor, which will provide detailed operating instructions for the specific use of State employment security agencies.

The assumptions underlying this publication are: (1) State and area manpower requirements estimates can be made more reliable if the analyses are made within the context of nationwide economic and technological developments. (2) Regional manpower analysts familiar with local markets, the movement of industry into an area, and other factors affecting local industry and occupational employment are best able to estimate manpower requirements at the local level. (3) Selection of an appropriate projection technique or mix of techniques should take into account the financial resources available to the regional manpower analysts, the technical sophistication of their staff, the volume of projections required, the purpose of the projections as they affect the need for accuracy and detail, and the availability of computer assistance.

The Bureau of Labor Statistics hopes that by providing a consistent and reasonably detailed national manpower framework and a guide to its use in making State and area manpower projections the well–informed local analyst will be aided in developing or improving local manpower projections.

This report was prepared in the Bureau of Labor Statistics' Office of Manpower and Employment Statistics. The study was performed by staff of the Bureau's Division of

Manpower and Occupational Outlook. It was planned and supervised by Sol Swerdloff and Russell B. Flanders. Richard E. Dempsey, David P. Lafayette, James W. Longley, Neal H. Rosenthal, and Joe L. Russell prepared or supervised preparation of major parts of the study. Other staff members contributing to the research and writing were Liguori O'Donnell, Melvin Fountain, Gerard Smith, Michael Crowley, Lloyd David, Penny Friedman, Edward Ghearing, William Hahn, Jerry Kursban, Annie Lefkowitz, Dorothy Orr, Judson Parker, Irving Phillips, Joseph Rooney, Norman Root, John Sprague, Howard Stambler, and Annie Asensio.

The industry–occupational matrices for 1960 and 1975 were developed in the Division of Occupational Employment Statistics, under the direction of Harry Greenspan. The Office of Manpower Research of the Manpower Administration, U.S. Department of Labor, funded a large part of the development of the national industry–occupational matrix for 1975. The projections of the labor force were prepared by Sophia Cooper Travis, Chief, Division of Labor Force Studies and by Denis F. Johnston of that Division. The illustrative labor force projections by State presented in the appendix were reprinted from Special Labor Force Report No. 74, prepared by Denis F. Johnston and George F. Methee of that Division. Information on trends in output per man–hour was provided by the Office of Productivity, Technology, and Growth. Especially valuable was information on technological trends in major industries collected by that office under the direction of Edgar Weinberg. In the projections of employment by industry, extensive use was made of the work on estimates of industrial output and employment carried on by the Division of Economic Growth, as part of the Interagency Growth Study Project.

The Bureau wishes to acknowledge the encouragement received from the Coordinating Committee on Manpower Research (CCMR) of the U.S. Department of Labor, which recommended the development of this report. We also appreciate the assistance of many representatives of other Federal agencies, State government agencies, private research organizations, trade associations, labor unions, and colleges and universities.

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INTRODUCTION

In a growing economy, the occupational composition of the work force, as well as the skills required in each occupation, changes through the years. Present manpower needs therefore are an uncertain guide to future requirements. To plan education and training programs to meet tomorrow's manpower needs, projections are needed of these changing manpower requirements. Such projections can help also in the vocational guidance of young people. To the extent that education, training, and vocational guidance accurately reflect the changing character of manpower needs, imbalances between manpower requirements and labor supply can be reduced, the productivity of the economy and the earning power of workers enhanced, and structural unemployment minimized.

The manpower legislation passed in the early 1960's emphasized the need for projections of occupational requirements and supply information. The Area Redevelopment Act of 1961, the Manpower Development and Training Act of 1962, the Vocational Education Act of 1963, and the Higher Education Facilities Act of 1963 were concerned with the education and training needs of the Nation. Some of these acts specifically provided that occupational needs should be one of the factors on which education and training programs should be based. Other legislation, such as the Economic Opportunity Act of 1964, the Civil Rights Act of 1964, the Higher Education Act of 1965, and the Appalachian Regional Development Act of 1965, focused additional attention on the need for up–to–date information on future skill requirements. *Tomorrow's Manpower Needs* is an attempt to provide a basis for developing manpower requirements information for States and areas through the use of national manpower information. The report presents the latest projections of national manpower requirements and provides a guide to their use in developing State and area manpower projections. The Bureau hopes that this information will be useful also in planning national programs of education and training, and in reviewing the extent to which State and local programs are meeting the Nation's manpower needs. Specifically, the publication provides information on the impact of national developments on industry and occupational manpower requirements. It presents the results of research on the growth and changing composition of the population and the labor force, the relative growth of industries, the effect of automation and other technological changes and economic factors on industry employment, the occupational structure of industries, patterns of working life, and techniques for appraising the supply of workers having various skills. This information is provided to serve as a background and tool for the appraisal of manpower requirements at the State and local level.

The bulletin reflects the continuing program of manpower research conducted by the Bureau of Labor Statistics. Consequently, the projections of industry and occupational employment requirements supersede those published in previous Bureau reports. In addition, some of the projection data never have been published before by the Bureau in the detail presented in this report. It is anticipated that *Tomorrow's Manpower Needs* will be revised every few years to reflect the latest information available as a result of the Bureau's continuing program of manpower research.

The Bureau of Employment Security currently is preparing a companion volume, *Handbook for Projecting Manpower Requirements and Resources for States and Areas,* which will explain in additional detail how analysts in State employment security agencies can use various methods and sources of data, including the national manpower information presented in this report, to develop State and area manpower estimates and projections.

This volume presents a discussion of industry employment trends and occupational structure, and projections of manpower requirements for each major industry in the economy. Also included is a discussion of the reasons for the expected changes.

The Bureau of Labor Statistics, as its resources permit, may be able to provide technical assistance, including clarification of the methods described in volume I of this Bulletin, to organizations developing State and area manpower projections. Requests for such assistance should be made to the appropriate BLS Regional Office, located as follows:

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TOMORROWS MANPOWER NEEDS: VOL. II

DEFINITIONS AND LIMITATIONS OF THE DATA

The industry statements that appear in this chapter are presented in two parts, each of which is related to a different series of employment data. Differences in coverage between these series must be understood for the reader to properly evaluate the information in these statements.

In the sections on current employment and employment trends and outlook, employment data relate to wage and salary workers. These data, collected by the Bureau of Labor Statistics from payroll reports of employers, represent the number of jobs in the nonfarm economy and count multiple jobholders in each job they hold. Excluded from these data are self–employed workers, unpaid family workers, and domestics in households. These data are available in greater industry detail and include more past years than any other employment series.

In the industry sections on occupational structure, on the other hand, the data relate to all employees, including wage and salary workers, self–employed, unpaid family workers, and domestics. In addition, unlike the BLS wage and salary data discussed previously, the total employment data exclude the secondary jobs of multiple–job holders.

Another major difference between the sections on wage and salary employment trends and projections and on occupational structure concerns government workers. The wage and salary data for government cover all civilian employees in government, regardless of function. The occupational structure data, on the other hand, cover only government workers in public administration, i.e., those workers engaged in activities that are uniquely governmental in nature.[1] Government employment in functions other than public administration is classified in the appropriate industrial classification–e.g., government education workers are included in educational services, government hospital workers are included in hospitals, and government construction workers are included in the construction industry.[2]

In interpreting the discussion of projected changes in occupational ratios between 1960 and 1975, readers should exercise special care. These ratios represent only the relative importance of each occupation in an industry. To measure changes in actual employment requirements in an occupation, the ratios must be applied to actual national employment figures for the appropriate industry, as shown in volume IV, appendix C.

Numerous references are made in this report to "white–collar" and "blue–collar" workers. White–collar workers include professional, technical, and kindred workers; managers, officials, and proprietors; clerical and kindred workers; and sales workers. Blue–collar workers include craftsmen, foremen, and kindred workers; operatives and kindred workers; and laborers, except farms.

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[1] Industry-occupational patterns are not available for all government workers, but only for public administration (see appendix G). No discussion of the occupational structure of public administration is included because it represents such a small part of total government employment and differs so much from total government employment. Occupational patterns also are not available for the ordnance major industry group. In the industry-occupational matrix, employment in the ordnance industry is included in the instruments and fabricated metal products industry groups.

[2] For more information about differences between BLS wage and salary employment and total employment related to the industry-occupational patterns, see Vol. I, Ch. 1, and Vol. IV, appendix A.

The projections of manpower requirements presented in this report are based on a labor force of 94.1 million workers in 1975, and assume that the size of the Armed Forces will be 2.7 million in that year. Subtracting the Armed Forces from the total labor force results in a civilian labor force of 91.4 million workers. Assuming a national unemployment rate of 3 percent, total employment requirements in the United States in 1975 will be 88.7 million, an increase of 22 percent over the 72.9 million workers employed in 1966. This projected increase in requirements reflects both the expected growth in the labor force and the added rise in employment involved in reducing unemployment from 3.8 percent in 1966 to the assumed 3 percent level in 1975.[3]

Despite the projected overall increase of over one–fifth in total employment requirements, manpower needs in agriculture are expected to continue to decline between 1966 and 1975, even under conditions of generally full employment in the economy. In contrast to the decline in agricultural manpower needs, the projections for 1975 show a rise of nearly one–fourth (23 percent) in total manpower needs of the nonfarm economy of nearly one–fourth (23 percent). By 1975, nonfarm manpower requirements are expected to increase by more than 16 million over the 68.9 million employed in 1966. Most of the increased nonfarm manpower needs will be in wage and salary employment. However, the number of other nonfarm workers (domestics, self–employed, and unpaid family workers) also is expected to increase over the 9-year period.

The figures cited above include all workers in the farm and nonfarm economy, including wage and salary workers, self–employed, unpaid family workers, and domestics, as covered in the monthly labor force surveys of households made by the Bureau of the Census for the Bureau of Labor Statistics. The discussion of industry employment that follows, however, relates only to the estimates of wage and salary employment derived by the Bureau of Labor Statistics from payroll reports and excludes self–employed, unpaid family workers, and domestics in households. In addition, the data on wage and salary workers represent the number of jobs in the nonfarm economy rather than the number of people, and thus count multiple job holders in each job they hold.

Because of the differences in the way the data are collected, and because of multiple jobholding, the count of jobs from the establishment surveys of the Bureau of Labor Statistics has generally been 2.0 to 2.5 million higher than the count of people employed as wage and salary workers based on the household surveys of the Bureau of the Census.[4] Thus, in order to translate the projections of the overall number of people (based on household survey data) into the number of jobs (estimated from reports based on payrolls), it was necessary to estimate the difference between the count of jobs and the count of people in 1975. The employment trends projected for each industry division discussed below are thus related to a projection of 75.9 million nonfarm wage and salary jobs in 1975.

The projections of manpower requirements for nonagricultural wage and salary workers presented in this study indicate that the rate of job growth will continue to be faster in the service–producing industries than in the goods–producing industries. (See table 1.) Employment in the goods–producing industries--manufacturing, construction, and mining–rose 25 percent between 1947 and 1966, or from 18.5 million to 23.1 million. Significant gains in productivity resulting from automation and other technological developments permitted large increases in output in the goods–producing industries without a corresponding increase in employment.

Between 1966 and 1975, manpower requirements in the goods–producing sector are expected to increase by 6 percent to 24.5 million. The projected gain in manpower requirements in contract construction (27 percent) contrasts sharply with mining, where little change is expected. Manpower requirements in manufacturing are expected to rise by about 3 percent, or less than one–sixth the rate of increase in total wage and salary employment.[5]

Requirements in the service–producing industries–transportation and public utilities; trade; finance, insurance, and real estate; service and miscellaneous indus-

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[3] For a more thorough discussion of the assumptions and methods of the national projections, see Vol. IV, appendix A.

[4] For a discussion of the differences in composition and employment levels between the monthly labor force surveys and the Bureau of Labor Statistics estimates of employees in nonfarm establishments, see the technical appendix in any current issue of the BLS periodical, *Employment and Earnings* and *Monthly Report of the Labor Force.*

[5] See Vol. IV, appendix B for projections of nonagricultural wage and salary workers, by industry, 1960, 1966, and projected 1975.

Table 1. Nonagricultural Wage and Salary Workers, by Major Industry Division, Actual 1966 and Projected 1975 Employment Requirements

(In thousands)

Industry division	Actual 1966 employment		Projected 1975 1/ requirements		Percent change, 1966-75
	Number	Percent	Number	Percent	
Total 2/	63,982	100.0	75,900	100.0	18.6
Goods producing industries	23,103	36.1	24,530	32.3	6.2
Mining	625	1.0	620	0.8	-0.8
Contract construction	3,292	5.1	4,190	5.5	27.3
Manufacturing	19,186	30.0	19,720	26.0	2.8
Service producing industries	40,880	63.8	51,370	67.7	25.7
Transportation and public utilities	4,151	6.5	4,580	6.0	10.3
Trade	13,211	20.6	16,115	21.2	22.0
Finance, insurance, and real estate	3,102	4.8	3,725	4.9	20.1
Services and miscellaneous	9,545	14.9	12,915	17.0	35.3
Government 3/	10,871	17.0	14,035	18.5	29.1

1/ Based on an assumed national unemployment rate of 3 percent.

2/ Represents wage and salary employment as covered in the BLS monthly establishment survey, which excludes self-employed, unpaid family workers, and domestic workers in households.

3/ Data for Federal Government, included in this series, relate to civilian employment only and exclude the Central Intelligence and National Security Agencies.

tries; and government–are expected to increase rapidly, but at a slower rate than during the post-World War II period. Between 1947 and 1966, the number of workers on the payrolls of these industries rose by 61 percent, rising from 25.4 million to 40.9 million. Manpower requirements in the service–producing industries are expected to increase by 26 percent between 1966 and 1975, reaching about 51.3 million in the latter year.

The largest increase in manpower requirements in the service–producing sector is expected to be in the services and miscellaneous industries group (a growth of 35 percent). The expected increases in government (29 percent) and in trade (22 percent) are greater than for total nonagricultural wage and salary employment (19 percent). The number of jobs in finance, insurance, and real estate, on the other hand, will increase at about the same rate as total nonfarm wage and salary employment (20 percent), and manpower requirements in transportation and public utilities are expected to rise only moderately (10 percent).

The composition of industry in the United States will change in the years ahead as a result of different rates of growth among industries. Employment in the service and miscellaneous industries and government will increase significantly as a proportion of total nonagricultural wage and salary employment. Other industries whose relative importance will increase are trade and contract construction. On the other hand, the relative importance of manufacturing will decline substantially. Slight declines in relative importance also are anticipated in transportation and public utilities and mining. The following sections of this chapter treat in detail employment trends and outlook and changing occupational patterns in major industries.

AGRICULTURE[6]

Current Employment

Over 4.2 million workers were employed in agriculture in 1966. Self–employed and unpaid family workers accounted for two–thirds of this total, while women workers accounted for almost 20 percent. (See table 2.)

Employment in agriculture is concentrated in a relatively few major types of farming. In 1966, about two–thirds of the workers engaged in commercial farming were employed on livestock, dairy, cash grain, and cotton farms. The remaining workers on commercial farms were employed on farms producing vegetables, fruits and nuts, poultry, tobacco and miscellaneous farm products, and other farm commodities. Virtually all self–employed farmers and unpaid family farm workers were engaged in commercial farming activity.

Employment Trends and Outlook

Agricultural employment decreased from about 8 1/4 million to nearly 4.2 million between 1947 and 1966, or nearly one–half. Accompanying the decrease in employment was an even sharper decline in man hours of farm work, which shrank from 17.2 to 7.5 million hours between 1947 and 1966. During the same 19-year period, total farm output increased by 40 percent.

There were wide variations in the rate of employment decline in various types of farming. For example, between 1947 and 1966, man–hours of labor on cotton farms declined by more than 80 percent; on farms producing food and feed grains, it declined by 70 percent compared with a 43-percent decline in man–hours on tobacco farms and a 50-percent decline on farms specializing in production of livestock.

The major factor responsible for the decline in farm employment during the post-World War II period has been the great increase in the efficiency of farm operations resulting from the greater use of powered farm equipment and scientific farming techniques on increasingly larger farms. Between 1947 and 1965, the size of the average farm increased from about 197 acres to 351 acres, and crop production per acre rose by 51 percent.

Agricultural employment[7] is expected to continue to decline in the future–from 4.2 million in 1966 to 3.7 million 1975, despite a rise of about one–fifth in agricultural output. (See volume IV, appendix B.) Demand for agricultural products will continue to increase, primarily as a result of a growing national and world population.

Employment in agriculture is expected to decline for reasons similar to those in the past. The growing use of electrical and mechanical power equipment will continue to reduce labor requirements. The competitive advantages of large farms will force many operators of less–efficient, small farms to sell their holdings or divert them to other uses. The more efficient small farm operators will enlarge their farm holdings to take advantage of the economies of increased size made possible through mechanization.

Occupational Structure

The nature of agricultural production requires two broad classifications of workers–those engaged in actual operation of farms and those in establishments that provide agricultural services, such as threshing, ginning, crop dusting, veterinary medicine, and animal breeding. In 1960, more than 9 out of 10 workers in agriculture[8] were either farmers or farm managers, laborers, or foremen–workers engaged in the operation of farms. (See volume IV, appendix G.) Of these workers, slightly more than half were either farmers (owners or tenants) or farm managers. Nearly one–fifth were unpaid family

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[6] This major group includes commercial farms; non-commercial farms (those not having the production of farm products for sale as the principal purpose of business); and establishments primarily engaged in performing agricultural, animal husbandry, and horticultural services on a fee or contract basis, except grist mills. Commercial hunting and trapping and the operation of game preserves are also included.

[7] The concept of employment requirements is less relevant in discussing actual levels of employment in agricultural than in most other industries. Because so many farmers own their own farms and continue in farming even though their incomes are low and their contribution to agricultural production for the market negligible, real manpower requirements in agriculture have been well below the number actually engaged in this work. The projections of employment in agriculture in this report are, therefore, not estimates of manpower required to produce the anticipated level of farm output in 1975, but are projections of the number of workers likely to be employed in agriculture.

[8] Including self-employed and unpaid family workers as well as wage and salary workers.

Table 2. Employment in Agriculture, by Class of Worker, 1966

(In thousands)

Agriculture (01, 02, 07 except 0713)	Number of workers	Percent distribution	Women workers as percent of total
Total employment	4,206	100.0	18.4
Wage and salary workers	1,369	32.5	17.2
Self-employed workers	2,147	51.0	6.0
Unpaid family workers	690	16.4	59.6

Note: Because of rounding, sums of individual items may not equal totals. Data from the Monthly household survey of the labor force.

workers, and the remainder were hired workers who received a wage or salary. About 4 percent of the more than 2 million commercial farms in 1960 employed over three–fourths of all hired farm workers.

In the decade ahead, a significant shift in the occupational structure of the agricultural industry can be expected. Farms will be larger in size and fewer in number, more specialized in function, increasingly mechanized, and professionally managed.

The increasing application of technological innovations will reduce the need for agricultural workers. However, requirements for some types of farm workers and those that perform agricultural services will increase. For example, farm managers trained in modern farming techniques will make up an increasing share of employment as farms become larger and more specialized. Although the proportion of farm laborers will continue to decline, those who can operate farm equipment, such as threshers and combines, will increase. A significant number of these farm equipment operates will be self–employed, as many large farm managers find it economically advantageous to contract out such work.

The growing use of complex farm machinery and equipment will tend to increase the ratio of mechanics and repairmen; the need for veterinarians will rise with the increasing number and value of livestock; and a growing demand for such workers as conservationists, inseminators, feed testers, and agricultural research scientists will boost the ratio of professional and technical workers. Increasing requirements for agricultural services, such as packing and shipping, poultry hatching, ginning, and landscape gardening and tree planting, will result in a gain in the proportion of managers and proprietors of establishments performing such services. In addition, more operatives, particularly truck drivers, will be needed to transport materials about farms and to move the increasing volume of agricultural products to storage and marketing areas.

MINING[9]

Current Employment

A total of 625,000 wage and salary workers were employed in mining in 1966. (See table 3.) About 45 percent of total employment was in the crude petroleum and natural gas major industry group. Coal mining accounted for more than one-fifth (22 percent) of total mining employment, most of it being in bituminous coal mining. The remaining workers were employed in quarrying and mining of nonmetallic minerals, except fuels, (19 percent) and metal mining (14 percent).

Production workers accounted for 78 percent of employment in mining. Among the different industry groups, the proportions of production workers ranged from 69 percent in crude petroleum and natural gas to about 87 percent in coal mining.

Women workers accounted for only 5.4 percent of employment in mining. Among the major industry groups, the proportion of women workers ranged from less than 2 percent in coal mining to nearly 9 percent in crude petroleum and natural gas.

Employment Trends and Outlook

Employment in mining declined between 1947 and 1966, despite an increase in mining output. Only coal mining experienced a decrease in both employment and output. Technological innovations that raised output per worker in coal mining were particularly significant because they were introduced at a time when that industry's total output was declining. In two major industry groups—crude petroleum and natural gas, and mining and quarrying of nonmetallic minerals—employment increased between 1947 and 1966.

Between 1947 and 1966, production workers decreased as a proportion of total employment in mining from 91 to 78 percent. During the more recent 1958-66 period, production workers as a proportion of employment increased slightly in one major industry group—metal mining—and decreased in all the other major industry groups. The decreasing production worker ratio in mining as a whole resulted primarily from the increasing mechanization of production operations.

Manpower requirements in mining are expected to be about 620,000 in 1975, relatively little changed from the 1966 level, despite an anticipated substantial increase in mining output. Employment growth will be limited because of the increasing use of new and improved laborsaving devices and techniques, such as new continous mining machinery systems and more efficient blasting methods in mining solid minerals, and more efficient exploration and recovery techniques in crude oil and natural gas extraction.

Manpower requirements in the mining and quarrying of nonmetalic minerals, except fuels, are expected to increase rapidly over the decade ahead, primarily because of the anticipated increase in the demand for construction materials, particularly for highway construction. (See volume IV, appendix B.) A slight increase in labor requirements is expected in metal mining as the demand for ores is stimulated by growing expenditures for consumer products, rising capital equipment expenditures, and a continued high level of defense spending.

In contrast, manpower requirements in coal mining are expected to decline, although at a slower rate than in the past. Demand for coal will be stimulated by the growing need for fuels for industrial processing and electric power. In addition, the competitive position of coal is likely to improve through the industry's use of unitized trains, new and improved slurry pipelines, and other modern means of mass transport to move coal more cheaply. Manpower requirements in crude petroleum and natural gas establishments are likely to remain relatively stable, despite the rising demand for the products of these industries.

Occupational Structure

All mining involves the extraction of minerals from the earth. However, because of the variety of minerals mined, there is a corresponding variety of production techniques and manpower requirements among the various mining industries. For example, in 1960, nearly half of all mining workers[10] were operatives. However,

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[9] SIC Division B. This division includes all establishments primarily engaged in mining. Mining is used in the broad sense to include the extraction of minerals occurring naturally: solids, such as coal and ores; liquids, such as crude petroleum; and gases, such as natural gas. The term "mining" also is used in the broad sense to include quarrying, well operation, milling (crushing, screening, washing, flotation, etc.), and other preparation needed to render the material marketable. Exploration and development of mineral properties are included.

[10] Includes self-employed and unpaid family workers, as well as wage and salary workers.

Table 3. Distribution of Wage and Salary Workers in Mining, by Industry, 1966

(In thousands)

SIC Code	Industry	Wage and salary workers		Production workers as percent of employment, by industry	Women workers as percent of employment, by industry
		Number	Percent distribution		
B	Mining	625.0	100.0	77.6	5.4
10	Metal mining	86.5	13.8	83.0	2.5
101	Iron ores	26.3	4.2	84.0	(3)
102	Copper ores	31.7	5.1	82.3	(3)
103	Lead and zinc ores	1/11.5	2/1.9	(3)	(3)
104-6, 8, 9	Other metal ores	1/16.9	2/2.7	(3)	(3)
11, 12	Coal Mining	137.7	22.0	86.9	1.6
11	Anthracite coal	1/ 8.5	2/1.4	(3)	(3)
12	Bituminous coal	129.9	20.8	86.8	(3)
13	Crude petroleum and natural gas	279.8	44.8	69.4	8.7
131, 2	Crude petroleum and natural gas fields	152.4	24.4	55.4	11.7
138	Oil and gas field services	127.4	20.4	86.0	5.2
14	Quarrying and nonmetallic mining	120.8	19.3	82.6	4.2
142	Crushed and broken stone	41.6	6.7	84.9	4.3
144	Sand and gravel	39.1	6.3	(3)	4.1
141, 5, 7-9	Quarrying and nonmetallic mining, not elsewhere classified	1/39.5	2/6.4	(3)	(3)

1/ Benchmark data for March 1966.
2/ Based on March 1966 total employment in the industry division.
3/ Data are not available.

Note: Individual items may not add to totals because of the inclusion of benchmark data and/or rounding.

in coal mining the proportion was much higher, mainly because of the need for many mine operatives for face work, such as drilling, cutting, and blasting; for the operation of mining equipment, such as tipples, ore cars, and cones; and for helpers to assist construction and maintenance men, such as plumbers, carpenters, electricians, and mining–machinery mechanics. On the other hand, the proportion of operatives in petroleum and natural gas extraction was significantly below the average for mining, reflecting the nature of drilling operations, which required a much smaller proportion of operatives. In petroleum and gas field operations, special equipment is used to pump oil or gas from wells to, and among, storage tanks. In 1960, many stationary engineers (pumpmen) were needed to operate this equipment, check tank gages and pump meters, and keep production records. Thus, the proportion of stationary engineers (craftsmen, not elsewhere classified) in petroleum and natural gas extraction was much higher than the average for mining.

Surface (or strip) mining involves the extensive use of earth moving equipment, including trucks. Because this mining technique was used, to a varying degree, in all three solid mineral mining industries, these industries had a much higher proportion of excavating machine operators and truck drivers than petroleum and natural gas extraction, reflecting entirely different modes of extracting and transporting minerals.

The differences in mining operations between solid mineral and petroleum and natural gas extraction also were evidenced by the relatively high proportion of white–collar workers that were employed in the petroleum and natural gas extraction industry. This industry employed nearly twice the proportion of professional and technical workers than the average for mining industries because of the relatively greater need for geologists, geophysicists, and technicians in exploration activities; and for mining engineers, technicians, and draftsmen in the design and construction of natural gas liquids plants, pipeline systems, offshore drilling platforms, and other facilities. The proportions of managerial and clerical workers' in establishments engaged in the extraction of petroleum and natural gas also was much higher than the average for all mining. The greater need for clerical workers in petroleum and natural gas establishments is explained, in large part, by the larger average size of these establishments, where clerical workers usually account for a larger share of the work force, and the need of supporting personnel for professional, technical, and managerial workers.

Technological innovations are expected to have a significant effect on the occupational structure of the mining major industry group through the mid-1970's. They are expected to result in a substantial decline in the proportion of mine operatives and laborers in all types of mining. For example, the increasing use of more efficient blasting agents, power shovels, drilling equipment, and off–highway trucks in surface mining will reduce the ratio of mine operatives and laborers engaged in this type of mining. The more widespread use of continuous mining machinery and the long–wall mining techniques will cause the ratio of mine operatives to drop in coal mining. These workers also will be adversely affected by the growing use of computers in monitoring and controlling many types of mining operations. In the petroleum and natural gas extraction industry, more efficient drilling techniques and equipment, including automated drilling operations, will reduce the need for such operatives as drill operators and roughnecks. However, the extent of the reduction may be limited by an increase in activities, such as off–shore drilling and thermal methods in oil production, including secondary recovery in older fields.

The proportion of craftsmen, foremen, and kindred workers is expected to remain relatively stable in the overall mining industry through 1975. However, divergent trends are anticipated among the individual mining industries and among individual craft occupations. For example, the ratio of craftsmen is expected to rise in all mining industries except petroleum and natural gas extraction, where a sharp drop in the proportion of craftsmen, not elsewhere classified, primarily pumpmen, will more than offset increases in the relative share of most other craft occupations. This drop in requirements for pumpers will result primarily from the greater use of LACT systems.

Mechanics and repairmen will account for a larger share of total employment in all types of mining activity. The increasing use of complex mining production and processing equipment will sharply increase the needs for skilled workers to install, maintain, and repair this equipment.

The proportion of professional and technical workers is expected to increase in all types of mining; however, the greatest increase will be in petroleum and natural gas extraction, reflecting the growing complexity of production operations and increasing research and exploration activity. For example, the greater use of computer systems will increase the need for scientists and engineers as well as computer programming specialists. In addition, the use of more efficient exploration and recovery techniques should increase the need for geologists, geophysicists, mining engineers, and technicians.

Clerical workers are expected to increase as a proportion of total employment in all types of mining establishments, reflecting, in large part, an increase in the average size of mining establishments; and the increasing need for stenographers, typists, and secretaries as supporting personnel to professional and managerial workers, particularly in the petroleum and natural gas industry.

CONTRACT CONSTRUCTION DIVISION[11]

Current Employment

Nearly 3.3 million wage and salary workers were employed in contract construction in 1966. (See table 4.) Almost one–half worked for special trade contractors, slightly more than 30 percent were employed by general building contractors, and the remainder worked for heavy construction contractors.

Construction workers[12] accounted for 85 percent of total employment in contract construction in 1966, and approximately the same proportion of construction workers were employed by each of the division's three major industry groups. Women accounted for a very small proportion of the industry's employment.

Employment Trends and Outlook

Employment in contract construction establishments increased from nearly 2 million to nearly 3.3 million between 1947 and 1966, or by 66 percent. Employment reached nearly 3 million in 1956, then fluctuated downward to about 2.8 million in 1961, and since then has advanced steadily.

Rates of employment growth differed widely among the three contract construction major industry groups between 1947 and 1966. Employment increased very rapidly (about 83 percent) in the special trades contractors major industry group, mainly because of the increasing importance in electrical, plumbing, air–conditioning, and other work usually performed by special trades contractors. Very rapid employment growth (about 86 percent) in the heavy construction major industry group was spurred by a fourfold increase in expenditures for highway construction (in constant dollar terms), as well as increases in the construction of sewer and water systems, airports, bridges, dams, and similar projects. Employment by building construction general contractors also gained substantially (about 37 percent). Employment in the latter major industry group rose to more than a million in 1956; however, by 1966, employment was slightly lower (3 percent) than in 1956, reflecting, in part, a slowdown in the rate of increase in residential construction activity.

Construction workers decreased as a proportion of total wage and salary employment in the contract construction division, from 89 percent in 1947 to 85 percent in 1966. The rate of decline in the proportion of construction workers was slower in heavy construction than in the other two major industry groups.

Manpower requirements in contract construction are expected to rise by more than one–fourth between 1966 and 1975, to nearly 4.2 million workers. Construction activity is expected to be stimulated by a rising population and household formations, higher levels of personal and corporate income, a continued shift of the population from the cities to the suburbs, increases in government expenditures for highways and schools, and rising expenditures for new industrial and commercial facilities. Employment growth, however, will be limited by the increased use of more efficient materials handling equipment, prefabricated building components prepared off the construction site, new and improved construction materials, and other technological innovations.

Manpower requirements are expected to rise in all three major industry groups, although faster increases are expected among heavy construction contractors than among general and special trades contractors. (See volume IV, appendix B.) A growing volume of highway construction generated by the Federal Government's long–range highway development program is expected to be an important factor in stimulating employment in heavy construction. Employment requirements of special trades contractors also are expected to increase rapidly, primarily because of the trend toward multi-bathroom homes, air–conditioning, and more extensive wiring systems required by the growing use of electrical appliances and machines. A moderate to rapid increase in employment requirements is expected among general building contractors, mainly because of the expected increase in residential building spurred by a high rate of family formation.

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[11] SIC Division C. This division covers three major industry groups, as follows: (a) building construction general contractors, who construct residential, farm, industrial, commercial, public, or other buildings; (b) heavy construction general contractors, who engage in heavy construction, such as highways and streets, bridges, sewers, railroads, irrigation projects, flood control projects and marine construction, and miscellaneous types of construction work other than buildings; and (c) special trade contractors, who specialize in activities such as plumbing, painting, plastering, and carpentry.

[12] Construction workers include working foremen, journeymen, mechanics, apprentices, laborers, etc., whether working at the site of construction or in shops or yards, at jobs (such as precutting preassembling) ordinarily performed by members of the construction trades.

Table 4. Distribution of Wage and Salary Workers in Contract Construction, by Industry, 1966

(In thousands)

SIC Code	Industry	Wage and salary workers		Construction workers 2/as percent of employment, by industry
		Number	Percent distribution	
	Contract construction	3,292.0	100.0	85.0
15	General building contractors	1,047.3	31.8	86.1
16	Heavy construction contractors	673.9	20.5	86.2
161	Highway and street construction	326.8	9.9	88.8
162	Other heavy construction	347.1	10.5	83.9
17	Special trade constractors	1,570.9	47.7	83.7
171	Plumbing, heating, and air-conditioning	373.1	11.3	81.1
172	Painting, paperhanging, and decorating	141.0	4.3	89.0
173	Electrical work	250.4	7.6	80.4
174	Masonry, plastering, stone and tile work	235.0	7.1	90.9
176	Roofing and sheet metal work	112.2	3.4	81.0
177	Concrete work	1/62.7	3/ 2.1	(4)
175, 8, 9	Other special trade contractors	1/367.2	3/12.3	(4)

1/ Benchmark data for March 1966.
2/ See text; footnote 2.
3/ Based on March 1966, total employment in the industry division.
4/ Data are not available.

Note: Individual items may not add to totals because of the inclusion of benchmark data and/or rounding.

Occupational Structure

The complexity of today's construction activity requires the use of a wide range of building materials and machines, and the services of an equally diverse group of specialists who can use them. In 1960, construction industry employment[13] contained a higher proportion of craftsmen and foremen (over 50 percent) than any other industry division. (See volume IV, appendix G.) Carpenters, who outnumbered the industry's combined force of professional, technical, clerical, and sales workers, were employed in activities ranging from foundation work on dam construction to finishing work on kitchen cabinets. To assist craftsmen and to move onsite materials, a high proportion (over 18 percent) of laborers were employed in this industry in 1960.

In the decade ahead, technological developments are expected to have a significant effect on both the number and characteristics of contract construction jobs. For example, increases in the size, capacity, speed, and mobility of construction machinery will decrease unit labor requirements for operators. New construction methods also will increase worker efficiency on construction projects.

Overall, these laborsaving innovations are expected to reduce somewhat the proportion of craftsmen and laborers by 1975. However, the rates, and even the direction, of change in the relative position of individual occupations are expected to differ. For example, the proportion of carpenters is expected to decline significantly due to the growing use of prefabricated components, such as roof trusses, floors, and wall panels that can be produced more efficiently offsite and lifted into place onsite by cranes. Improved adhesives and nails, new types of power tools, and the increasing use of nonwood materials, including glass, aluminum and plastics, also will tend to reduce requirements for carpenters. More widespread use of materials such as aluminum and plastic are also expected to adversely affect the proportion of painters in the construction industry. Longer lasting paints and greater use of spray and roller painting equipment are likely to contribute to this reduction.

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[13] Including self-employed and unpaid family workers, as well as wage and salary workers, both those employed in private enterprises and those in government agencies that are engaged in construction related activities, such as the Alaska Road Commission and State and local highway departments.

On the other hand, the ratio of mechanics is expected to increase in response to the growing use of scrapers, concrete paving machines, tower and climbing cranes, and other complex machinery requiring repair and periodic maintenance. The proportion of excavating, grading, and road machinery operators also should rise, due principally to an increase in heavy construction activity, particularly highway construction.

Laborers who perform material handling jobs are expected to decline relatively as materials such as concrete and brick are moved increasingly by forklift trucks, motorized wheel barrows, and conveyor belts, and lifted to upper floors by cranes and highspeed mechanized hoists.

The proportion of professional and technical workers will increase, in large part, because of increasing requirements for engineers. These workers will be needed to design and supervise a growing number of complex construction projects, such as high–rise apartments having intricate air–conditioning, heating, and ventilating systems, and industrial plants having extensive wiring and plumbing systems, to facilitate quick realinement of production operations. The increase in urban highway and rapid transit systems also will boost the need for these workers.

Laborsaving innovations that reduce the proportion of some types of workers will increase the ratio of others. For instance, certain wall techniques may shift employment from carpenters and bricklayers to ornamental–iron workers; and the use of prestressed concrete in the place of steel beams may shift work from the structural–metal worker to cement masons and other workers.

MANUFACTURING[14]

Current Employment

About 3 out of 10 nonagricultural wage and salary workers in 1966 were employed in manufacturing. Approximately three–fifths of the 19 million workers in manufacturing were located in durable goods plants. (See Table 5.) Among the major industry groups within manufacturing, the largest employers were the machinery, transportation, and food and kindred products industries, each having approximately 10 percent of total manufacturing employment. The smallest employer in manufacturing was the tobacco industry, which employed less than 90,000 workers.

Production workers accounted for 74 percent of total manufacturing employment in 1966. The proportion of production workers in both the durable and nondurable goods industries was about the same as that for all manufacturing.

Women workers accounted for 27 percent of all manufacturing employment in 1966. The proportion of women workers differed considerably between the two general classes of manufacturing industries. Women composed 38 percent of total employment in the nondurable goods industries compared to 19 percent in the durable goods establishments.

Employment Trends and Outlook

Employment in manufacturing establishments increased from 15.5 million to about 17.3 million between 1947 and 1964, or by 11 percent. Since 1964, there has been a sharp increase in manufacturing employment from 17.3 million to nearly 19.2 million. A recent BLS study[15] indicates a large share, over one-third, of this increase is directly attributable to the Viet Nam buildup, most of the impact being felt in durable goods industries such as ordnance, electrical equipment, and aircraft and parts. During the 1947-66 period, output rose by 139 percent. Major factors responsible for the growing demand of manufactured goods over the 1947-66 period were continued rapid growth of the population, rising personal and corporate incomes, growth in numbers of households, rising business activity, and in recent years, the increase in defense expenditures. Labor-saving technological innovations, more efficient management, better trained workers, and a variety of other factors increased output per worker and allowed much of the growing demand for manufactured goods to be satisfied without commensurate increase in employment.

Although manufacturing employment was higher in 1966 than in 1947, employment did not grow consistently. Employment increased from 15.5 million in 1947 to 17.5 million in 1953, a period of high economic activity resulting from high demand for durable consumer goods and new plant equipment; large Federal expenditures for military items; and favorable trade balances in foreign trade. Between 1954 and 1966, manufacturing employment fluctuated with general business activity, but until 1965, it did not surpass the 1953 level–falling as low as 15.9 million in 1958 and rising as high as about 17.2 million in 1956, 1957, and 1964.

Between 1947 and 1966, employment in the durable goods manufacturing industries increased by 34 percent, and in the nondurable industries, by 11 percent. Production increased by 156 percent in durables and by approximately 124 in nondurables, indicating a faster increase in output per worker in nondurable than in durable goods industries.

Changes in employment among individual manufacturing industries varied widely between 1947 and 1966. Employment in the ordnance and accessories industry, for example, increased nearly 850 percent between 1947 and 1966, as demand for military items for the earlier Korean conflict and current Viet Nam buildup stimulated production. The complex items manufactured by this industry required considerable hand labor. In addition, the rapid obsolescence of many items limited the application of mass production techniques in their manufacture. Similarly, segments of the electrical equipment industry that fabricates complex electronic items for sophisticated military–space products were unable to introduce many mass production techniques for the same reasons.

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[14] SIC Division D. This division includes those establishments engaged in the mechanical or chemical transformation of inorganic or organic substances into new products, and usually are described as plants, factories, or mills, which characteristically use power-driven machines and materials handling equipment. Establishments engaged in assembling component parts of manufactured products also are considered manufacturing if the new product is neither a structure nor other fixed improvement.

[15] "The Employment Effects of Defense Expenditures", *Monthly Labor Review*, September 1967, pages 9-16.

Table 5. Distribution of Wage and Salary Workers in Manufacturing, by Industry, 1966

(In thousands)

SIC Code	Industry	Wage and salary workers		Production workers as percent of employment, by industry	Women workers as percent of employment, by industry
		Number	Percent distribution		
D	All manufacturing	19,186.0	100.0	74.4	27.1
	Durable goods	11,256.0	58.7	74.2	19.3
19	Ordnance and accessories	256.0	1.3	47.6	20.0
24	Lumber and wood products excluding furniture	612.6	3.2	87.3	8.4
25	Furniture and fixtures	461.7	2.4	82.9	20.0
32	Stone, clay, and glass products	644.6	3.4	80.3	15.7
33	Primary metal industries	1,345.4	7.0	81.4	6.3
34	Fabricated metal products	1,349.1	7.0	77.8	17.0
35	Machinery	1,911.1	10.0	70.4	13.5
36	Electrical equipment and supplies	1,896.4	9.9	69.4	40.4
37	Transportation equipment	1,911.5	10.0	71.2	10.3
38	Instruments and related products	433.1	2.3	63.9	35.4
39	Miscellaneous manufacturing industries	434.5	2.3	79.8	43.9
	Nondurable	7,930.0	41.3	74.7	38.2
20	Food and kindred products	1,778.9	9.3	66.4	24.9
21	Tobacco manufactures	83.9	0.4	85.2	46.1
22	Textile mill products	961.5	5.0	89.1	44.4
23	Apparel and related products	1,398.8	7.3	88.9	79.8
26	Paper and allied products	667.5	3.5	77.8	21.2
27	Printing, publishing, and allied industries	1,021.8	5.3	63.6	30.0
28	Chemicals and allied products	957.9	5.0	59.7	19.3
29	Petroleum and related industries	186.0	1.0	62.3	9.0
30	Rubber and miscellaneous plastics products	509.8	2.7	77.9	30.6
31	Leather and leather products	363.5	1.9	87.6	55.0

Note: Individual items may not add to totals because of rounding.

Employment increased in some industries despite the existence of mass production techniques. For example, in the chemical and allied products industry, which has utilized a continuous flow process for years, the rapidly increasing demand for chemical products caused total production to grow faster than output per worker. On the other hand, employment declined in other industries, such as petroleum refining, tobacco manufacturing, and lumber and wood products, as laborsaving innovations, including more mechanized production processes, increased output per worker faster than total production.

Production workers decreased as a proportion of total employment in manufacturing from about 84 percent in 1947 to 74 percent in 1966. The amount of decrease was reflected about equally in both durable and nondurable goods manufacturing.

Manpower requirements in manufacturing are expected to increase to nearly 20 million workers by 1975. This increase is at a considerably slower pace than that experienced in the 1958-66 period, chiefly because of the current high levels of employment in certain industries resulting from the Viet Nam buildup. Employment trends in these industries are assumed to return to pre–Viet Nam employment patterns by 1975. As in the past, changes in employment in individual manufacturing industries are expected to vary widely, depending primarily on rates of change in production and the impact of technology. The increasing application of technological innovations to manufacturing processes is expected to continue to reduce unit labor requirements in manufacturing.

All manufacturing industries will not be affected equally by technological change. For example, in some industries, such changes may reduce employment growth by increasing output per employee faster than total production. On the other hand, technological changes in other industries may create new products and markets and increase production and employment. In nearly all industries, technological changes are expected to affect occupational patterns. For example, requirements should increase for skilled maintenance and repair workers to insure the operation of complex equipment, and requirements for machine tenders and materials handlers should fall.

Most of the technological developments that are expected to affect employment in manufacturing can be included in seven broad categories: Numerical controls; new metal processing methods; machinery improvements; improved materials handling (including layout); new and improved raw materials and products; instrumentation and automatic controls; and electronic computers.

In the metalworking industries, more automatic production is being achieved through numerical control. This innovation provides a means of automatically controlling the operation of machine tools and certain other types of equipment by means of numerically coded information recorded in advance on punched cards, magnetic tape, or punched paper tape. Numerical control already is finding numerous applications in drafting, welding, and wiring operations. Expanding use of these techniques will be an important development in nearly all the metal working industries but will have very limited use in the nondurable industries.

New developments in metal processing, such as the basic oxygen process, will continue to reduce unit labor requirements and alter occupational patterns in primary metals establishments.

Improvements in machinery will continue to contribute to increased output per employee throughout manufacturing. New and improved models of automatic machinery, such as that used for stamping, pressing, bottling, packaging, or printing will continue to be introduced. Improvements in standard machinery will continue to be made by incorporating more powerful motors, heavier frames, simpler controls, and variable motor speeds.

Another important development in machine design is the trend toward the integration of hitherto separate machine operations into one large machine complex that carries through a series of operations with a minimum of intervention on the part of the machine tender. Many automatic transfer lines have been built that integrate materials handling equipment with a series of machine tools. Such transfer lines are applicable to the mass production of a variety of products requiring metalworking operations, including components for automobiles, appliances, farm equipment, and office machinery. Machines that perform automatic assembly operations also are being introduced, although at the moment the number of manufacturers that can justify using automatic assembly machines are comparatively few (generally large firms in the fabricated metal products, electrical and nonelectrical machinery, and transportation equipment industries). However, such machines are expected to be used increasingly in the years ahead and could have adverse effects on the requirements for assemblers in some industries.

Increasing mechanization also is occurring in the movement of materials, from receipt of raw materials to the shipping of final products. More powerful and maneuverable models of forklift trucks, hoists, cranes, conveyors, and tractors are being introduced in many industries, including pulp and paper manufacturing, food processing, footwear manufacturing, meat packing, and foundries. For example, in the food and footwear industries, improved conveyors and other materials handling equipment are being used to move final products from the production line to the warehouse and the shipping platform.

Pneumatic conveyors are being used increasingly for moving granular materials. This technique is widely applicable in baking and in the manufacture of cement, flour, and fertilizer. The expanding use of improved materials handling equipment will primarily affect requirements for unskilled labor. These workers will most probably be replaced by smaller numbers of semiskilled workers to operate or monitor the equipment.

The development of new products is also expected to affect manpower requirements in many manufacturing industries. New products may create new markets and thus additional employment requirements, shift employment from one industry to another, modify occupational patterns, or decrease unit labor requirements. For example, new synthetic fibers that require fewer mill operations than natural textile mill products may reduce unit labor requirements. Plastic materials, which are readily adaptable to mechanical processing, are replacing metal and wood and causing an employment shift.

In many manufacturing industries, more measuring and control instruments and electronic computers are being used to increase the efficiency of continuous flow production processes. In the food industry, computers and sensors control the preparation of food, and other automatic equipment grade, weigh, and package food items. In textile mills, electronic monitoring systems and photoelectronic devices are increasingly being used for quality control and inspection. The use of electronic controls, such as magnetic flowmeters, is expanding in the paper industry in connection with the industry's increased emphasis on automatic quality control. The potential of computers seems especially significant in the continuous process industries, such as paper and chemicals, and their use in spreading into other industries, such as printing and primary metals. In the chemical industry, computers direct and control entire production processes, including automatic testing and analysis to insure optimum quality control. In pulp and paper, they are being used increasingly with paper machines to accelerate grade changes and prevent breaks in the web, while providing optimum use of input materials and greater machine productivity.

The increasing use of instrumentation and computers in manufacturing will have several effects on the numbers and types of workers employed. Employment requirements for maintenance, technical, and supervisory workers will increase and requirements for production workers should decline.

Additional information of likely effects on technological and other changes to occupational requirements in manufacturing industries are included in the individual statements that follow.

Ordnance and Accessories[16]

Current Employment

About 256,000 wage and salary workers were employed in the ordnance and accessories major industry group in 1966. (See table 6.) About three-fourths worked in establishments manufacturing ammunition, except small arms, 84 percent of whom were engaged in the production of guided missiles and spacecraft. About 5 percent of the employees in the ordnance industry were employed in establishments producing sighting and fire control equipment, such as bomb sights, gun data computers, windage instruments, aiming directors, and sound locators. The remaining workers in this major industry group were employed in other ordnance and accessories establishments making guns, howitzers, mortars, and related equipment; tanks and tank components; small firearms and small arms ammunition; or other ordnance and accessories.

Production workers accounted for 48 percent of the total employment in this industry in 1966, considerably lower than the average of 74 percent for all manufacturing. Two of the individual industry groups comprising the ordnance and accessories industry—ammunition except for small arms, and sighting and fire control equipment—had roughly about the same proportions of production workers. However, the proportions were much higher in the other ordnance and accessories industry group.

Women workers accounted for 20 percent of the total employment in the ordnance and accessories industry in 1966, compared with 27 percent for all manufacturing. The individual industry groups constituting the ordnance and accessories industry had about the same proportions of women workers.

Employment Trends and Outlook

Ordnance employment is highly responsive to changes in defense spending; since World War II, employment has fluctuated between 26,000 and 266,000 workers. Employment grew most rapidly during the Korean Conflict, rising from 30,000 in 1950 to about 234,000 in 1953. Employment declined after these hostilities but never below the pre–Korean level. Toward the end of the 1950's employment again began to rise because of

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[16] SIC 19. This major group includes establishments engaged in manufacturing artillery, small arms, and related equipment; ammunition; tanks and specialized tank parts; sighting and fire control equipment; and miscellaneous ordnance and accessories, not elsewhere classified.

Table 6. Distribution of Wage and Salary Workers in the Ordnance and Accessories Major Industry Group, by Industry, 1966

(In thousands)

SIC Code	Industry	Wage and salary workers		Production workers as percent of employment, by industry	Women workers as percent of employment, by industry
		Number	Percent distribution		
19	Ordnance and accessories	256.0	100.0	47.6	20.0
192	Ammunition except for small arms	192.6	75.2	42.0	19.5
1925	Guided missiles and spacecraft	161.7	63.2	34.4	17.8
1929	Ammunition (except small arms) not elsewhere classified	1/25.4	2/7.1	(3)	(3)
194	Sighting and fire control equipment	13.4	5.2	41.8	20.9
191, 3, 5, 6, 9	Other ordnance and accessories	50.0	19.5	70.6	21.6

1/ Benchmark data for March 1966.
2/ Based on March 1966 total employment in the major industry group.
3/ Data are not available.

Note: Individual items may not add to totals because of the inclusion of benchmark data and/or rounding.

the increasing importance of missile production; it reached its peak in 1963.

Between 1958 and 1966,[17] employment changes among the individual industry groups differed widely. Employment more than doubled in the ammunition, except small arms, industry. Employment in other ordnance and accessories establishments (those producing guns, mortars, tanks and tank components, small arms, and small arms ammunition) also increased. Most of the employment growth was due to the increased emphasis on missile and space vehicle development, the changing types of materials required for fighting a "limited war," and the replenishment of inventories. Employment declined by 68 percent in establishments engaged in manufacturing sighting and fire control equipment, reflecting the increased use of electronic equipment, such as computers and radar instruments, that are produced in other industries to perform sighting and fire control functions.

Production workers decreased as a proportion of total employment in this major industry group, from 52 percent in 1958 to 48 percent in 1966. The rate of decline during the 1958-65 period was much slower in establishments producing guns, mortars, tanks and tank components, small arms, and small arms ammunition than in the other industry groups.

Manpower requirements in ordnance are expected to be about 250,000 in 1975, or at about the level prior to the Viet Nam build up. Labor saving technological developments, such as numerically controlled machine tools, new processing automatic transfer equipment, and new processing techniques are expected to offset, in part, slightly higher levels of production.

A very important technological change affecting employment in ordnance establishments is the development of numerically controlled machine tools (N/C). Tape–controlled tools are particularly important in short production runs common in prototype development of missiles and spacecraft. A rapid rise in the number of N/C machines in use during the 1965-75 period could substantially limit employment opportunities in some occupations. For example, employment requirements for machine tool operators may be reduced somewhat by the widespread use of N/C machines. Requirements for highly skilled craftsmen, such as toolmakers and setup men, also would be reduced since fewer jigs, fixtures, and machine setups would be required. On the other hand, the use of numerically controlled machines would increase requirements somewhat for specially trained workers, particularly for jobs in computer operation and machine tool maintenance. It is possible that machining workers, skilled in the operation of conventional machines, could be trained to perform these jobs.

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[17] BLS employment (payroll) data for the individual industries in this major industry group are not available for the years prior to 1958.

Automatic transfer equipment is another development that will continue to limit employment growth in ordnance. Such equipment has been used increasingly to link machining operations, primarily in the manufacture of small arms. The employment impact of such equipment will fall heaviest on machine operators.

Computer applications in this industry, which now range from accounting and production control to scientific and engineering computations, are expected to have both employment reducing and employment generating effects. Laborsavings will occur chiefly in routine clerical work, such as billing, posting, filing, and maintaining records, and in some office machine operations, such as tabulating and bookkeeping. Computers also will tend to reduce employment in certain types of quality control and warehousing jobs as a result of improved production standards and tighter inventory control. Requirements for lower and middle management employees also may be reduced because of the centralization and coordination of managerial functions. Computers, however, may extend man's capabilities and produce conditions favorable to employment growth, especially for scientists, engineers and technicians. A notable example of computer generated employment in this industry is in the research, design, and testing of missiles, space vehicles, and their components. Present successes with computers in ordnance research and development indicate that even more extensive use will be made of computers in the future to aid in the development of new products and processes.

Food and Kindred Products[18]

Current Employment

About 1.8 million wage and salary workers were employed in the food and kindred products major industry group in 1966. (See table 7.) Five of the nine industry groups within this major industry group accounted for 1.4 million or nearly four–fifths of total employment in 1966–meat products, bakery products, dairy products, canned and preserved foods except meats, and beverages. The remaining workers were in establishments producing grain mill products, confectionery products, sugar, and miscellaneous food preparations.

Production workers accounted for 66 percent of total employment within this major industry group in 1966, compared with 74 percent for all manufacturing. The proportion of production workers in the individual industry groups constituting this major industry group differed widely, ranging from about 46 percent in the dairy products industry group to 85 percent in the canned and preserved foods industry group.

Women workers accounted for about 25 percent of total employment in the food processing industry establishments in 1966, slightly below the average for all manufacturing. Among the individual industry groups, the proportions of women workers ranged from 8 percent in the sugar industry group to 50 percent in the confectionery and related products industry group.

Employment Trends and Outlook

Employment in establishments manufacturing food and kindred products remained relatively stable between 1947 and 1966. During the same period, production rose by over one–half. Between 1947 and 1966[19], employment trends differed somewhat among the individual industry groups. For example, in meat products establishments–the largest food industry group–employment rose from about 275,000 in 1947 to about 338,000 in 1956, an increase of nearly one-fourth, then declined to about 324,000 in 1966. Employment in the bakery industry group–about 281,000 in 1947–increased to 304,000 in 1956, before declining to about 284,000 in 1966. In the dairy products industry group, employment dropped from

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[18] SIC 20. This major group includes establishments manufacturing foods and beverages for human consumption and certain related products, such as manufactured ice, chewing gum, vegetable and animal fats and oils, and prepared feeds for animals and fowls.

[19] BLS employment (payroll) data for the dairy products and the miscellaneous food products industry groups are not available for the years prior to 1958. Data for the grain mill products industry group are not available for years prior to 1951.

Table 7. Distribution of Wage and Salary Workers in the Food and Kindred Products Major Industry Group, by Industry, 1966

(In thousands)

SIC Code	Industry	Wage and salary workers		Production workers as percent of employment, by industry	Women workers as percent of employment, by industry
		Number	Percent distribution		
20	Food and kindred products	1,778.9	100.0	66.4	24.9
201	Meat products	323.8	18.2	79.9	26.9
2011	Meat packing plants	189.9	10.7	77.4	14.2
2013	Sausages and other prepared meats	52.5	3.0	71.0	29.9
2015	Poultry dressing and packing	81.5	4.6	91.5	54.7
202	Dairy products	277.5	15.6	45.9	15.2
2023	Condensed and evaporated milk	1/13.1	2/0.8	(3)	(3)
2024	Ice Cream and frozen desserts	29.8	1.7	52.3	21.5
2026	Fluid milk	198.7	11.2	37.2	12.8
2021, 2	Other dairy products	1/34.8	2/2.1	(3)	(3)
203	Canned and preserved foods except meats	275.7	15.5	84.6	44.9
2031, 6	Canned, cured and frozen sea foods	40.2	2.3	88.3	61.2
2032, 3	Canned food except sea foods	140.4	7.9	82.3	38.2
2034, 5	Dried, dehydrated and pickled foods	1/29.6	2/1.7	(3)	(3)
2037	Frozen fruits and vegetables	59.8	3.4	90.0	50.7
204	Grain mill products	127.8	7.2	70.1	14.2
2041	Flour and other grain products	30.2	1.7	71.9	9.3
2042	Prepared feeds for animals and fowls	58.0	3.3	65.7	12.2
2046	Wet corn milling	1/17.1	2/1.0	(3)	(3)
2043, 5	Other grainmill products	1/22.4	2/1.3	(3)	(3)
205	Bakery products	284.4	16.0	58.0	23.2
2051	Bread, cake and perishable products	241.4	13.6	53.5	18.6
2052	Biscuits, crackers, and pretzels	43.0	2.4	83.5	48.6
206	Sugar	35.6	2.0	80.6	7.9
2061	Cane sugar except refining only	1/ 9.8	2/0.6	(3)	(3)
2062	Cane sugar refining	1/11.6	2/0.7	(3)	(3)
2063	Beet sugar	1/ 9.5	2/0.6	(3)	(3)
207	Confectionery and related products	80.7	4.5	81.9	49.8
2071	Candy and other confectionery products	66.1	3.7	84.4	52.8
2072, 3	Chocolate and coca products, chewing gum	1/14.2	2/0.8	(3)	(3)
208	Beverages	229.3	12.9	51.6	11.7
2082	Malt liquors	62.2	3.5	66.1	5.9
2085	Distilled liquors	1/21.6	2/1.3	(3)	(3)
2086	Bottled and canned soft drinks	124.9	7.0	38.4	9.0
2083, 4, 7	Other beverages and related products	1/19.5	2/1.2	(3)	(3)
209	Miscellaneous food and kindred products	144.1	8.1	65.1	25.4
2091-3	Vegetable oils and fats	1/19.5	2/1.2	(3)	(3)
2094-9	Miscellaneous food preparations	1/123.8	2/7.3	(3)	(3)

1/ Benchmark data for March 1966.
2/ Based on March 1966 total employment in the major industry group.
3/ Data are not available.

Note: Individual items may not add to totals because of the inclusion of benchmark data and/or rounding.

about 319,000 in 1958 to approximately 278,000 in 1966.

Production workers decreased as a proportion of total employment in this major industry group, from 77 percent in 1947 to 66 percent in 1966. The rate of decline in the proportions of production workers during the recent 1958-66 period was much faster in establishments producing dairy products than in the other industry groups. The decreasing production worker ratio primarily resulted from the increasing mechanization of production operations.

Despite a rising demand for food, especially highly processed foods that need little preparation in the home, manpower requirements in the food and kindred products industry are expected to decline slightly between 1965 and 1975. (See volume IV, appendix B.)

Employment trends for the individual industries are expected to differ. Employment requirements in the meat production industry are likely to decline, despite increasing demand, because of the greater use of labor-saving technological innovations, such as automatic bacon slicers, sausage stuffers, frankfurter machines, electric stunners and saws, and mechanical hide strippers. In contrast, moderate employment gains are expected in the canned and preserved food industry group because of the large number of small plants having little mechanization, and because of increasing consumer demand for geriatric, dietetic, and other specialty foods.

Occupational Structure

Chicken plucker, bean snapper, bologna maker, alfalfa dehydrator, bread catcher–these are examples of the wide range of specialized operative jobs that characterize the food and related products major industry group. Nearly half of all workers[20] in this major industry group in 1960 were operatives (See volume IV, appendix G.) Although many were employed in the more common operative jobs, such as driver and deliverymen (particularly in dairy products and bakery products), the vast majority were in the residual "not elsewhere classified" occupational classification and performed specialized activities unique to a single industry.

Although the distribution of employment in this major industry group generally followed the average for nondurable goods industries, there were some variations. The ratio of professional and technical workers was substantially lower in food than in other nondurables, while that of managerial workers was considerably higher in the food manufacturing industry. These variations from the average of nondurables may be explained, to a large extent, by the prevalence of small firms in food manufacturing, particularly in the beverage industries and in grain mill products.

Technological innovations are expected to have some bearing on the nature of the industry's 1975 occupational structure. Noteworthy trends in the industry include more widespread use of improved conveyor and transfer systems to handle food in process; computers and environmental sensors to control preparation of food; and automatic equipment to grade, weight, and package a greater variety of foods. Improved communications to further coordinate and integrate activities among the various functional areas of an establishment and between geographically scattered divisions of an organization are also expected. The economies of scale made possible by improvements in equipment and methods (such as freezing processes in the baking industry) may be expected to continue the trend to fewer, but larger, food processing establishments in many food industries.

Laborers are expected to be most affected by such technological developments. More widespread use of improved conveyor and transfer systems to handle food in process will adversely affect such laborers as warehouse and shipping platform workers and materials handling workers. Other developments, such as the dairy industry's use of clean–in–place piping systems that can reduce pipe cleaning time by nearly one–half, contribute toward a significantly lower concentration of laborers by 1975. Ratios for other major occupational groups are expected to undergo only moderate change over the decade ahead.

Although technology is expected to reduce the percentage of many operatives used in production, this reduction will be largely offset by a substantial rise in the proportion of drivers and deliverymen needed to transport increasing amounts of food products required for an expanding population. Some skilled jobs such as baker and brewer will be adversely affected by increasing use of automatic batch mixing and instrument control. However, offsetting these reductions, needs will increase for instrument repairmen and other mechanics to maintain and repair equipment of growing complexity.

Expansion in the use of more highly mechanized equipment also will increase the relative position of professional workers. Greater emphasis on the development and operation of such innovations as environmental sensors to control the preparation of food should result in higher proportions of both engineers and technicians.

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[20] Including self-employed and unpaid family workers, as well as wage and salary workers.

Tobacco Manufactures[21]

Current Employment

Nearly 84,000 wage and salary workers were employed in the tobacco manufactures major industry gourp in 1966. (See table 8.) More than 70 percent of total employment in tobacco manufacturing in 1966 was concentrated in two industries–cigarettes (47 percent) and cigars (26 percent). The remaining workers were employed in establishments producing smoking and chewing tobacco and snuff; and in tobacco stemming and redrying establishments.

Production workers accounted for 85 percent of total employment in this major industry group in 1966, compared with 74 percent for all manufacturing. The proportion of production workers was lower in establishments manufacturing cigarettes (82 percent) than in those producing cigars (93 percent).

Women workers accounted for 46 percent of total employment in tobacco manufacturing in 1966; considerably higher than the 27 percent average for all manufacturing. The proportion of women was much lower in plants making cigarettes (37 percent) than in cigar producing establishments (71 percent).

Employment Trends and Outlook

Employment in tobacco manufacturing as a whole has declined steadily since World War II. However, employment in the cigar industry and the cigarette industry moved in opposite directions. Since 1947, employment increased rapidly (more than 33 percent) in establishments producing cigarettes, as increased demand for the industry's products more than offset job displacement caused by the expanding use of laborsaving mechanized equipment. During the same period, improved mechanization in the cigar industry outstripped demand for cigars, and employment declined by over 50 percent.

Production workers decreased as a proportion of total employment in this major industry group, from 93 percent in 1947 to 85 percent in 1966. The rate of decline was slower in cigarette manufacturing establishments than in those producing cigars.

By 1975, manpower requirements in tobacco manufacturing are expected to decline to about 80,000, somewhat below the 1966 level. (See volume IV, appendix B.) The increasing demand for tobacco products is expected to result mainly from population growth. However, it should be noted that the controversy over smoking and health, particularly cigarette smoking, continues to create uncertainty about the market for tobacco products. Information programs and restrictive legislation intended to discourage cigarette smoking could result in a shift in this industry's product mix. Also, both cigar and cigarette manufacturers are expected to expand their tobacco product lines in an effort to gain increased consumer acceptance. Nevertheless, laborsaving technological developments, such as wrapping, banding, and cartoning machines in this already highly mechanized industry group, are expected to more than offset increases in the production of tobacco products without the need for a larger workforce.

Occupational Structure

Although the tobacco manufactures industry is characterized by a high degree of mechanization, nearly 6 out of 10 workers[22] in this major industry group were operatives in 1960. (See volume IV, appendix G.) This occupational group included most workers engaged directly in the tobacco manufacturing process, including machine tenders, checkers, and cigar wrappers. Other workers that accounted for a significant proportion of employment were foremen, needed to supervise the operation of complex and expensive equipment, and skilled mechanics and repairmen, required to keep the machines in operation.

Laborsaving technological innovations in tobacco productions are expected to affect the number and characteristics of jobs through the mid-1970's, particu-

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[21] SIC 21. This major group includes establishments engaged in manufacturing cigarettes, cigars, smoking and chewing tobacco, and snuff; and in stemming and redrying tobacco.

[22] Including self-employed and unpaid family workers, as well as wage and salary workers.

Table 8. Distribution of Wage and Salary Workers in the Tobacco Manufactures Major Industry Group, by Industry, 1966

(In thousands)

SIC Code	Industry	Wage and salary workers		Production workers as percent of employment, by industry	Women workers as percent of employment, by industry
		Number	Percent distribution		
21	Tobacco manufactures-------------	83.9	100.0	85.2	46.1
211	Cigarettes--------------------	39.0	46.5	82.1	37.4
212	Cigars------------------------	22.0	26.2	92.7	70.9
213	Tobacco (chewing and smoking) and snuff--------------------	1/ 5.0	2/ 6.4	(3)	(3)
214	Tobacco stemming and redrying--	1/13.0	2/16.6	(3)	(3)

1/ Benchmark data for March 1966.
2/ Based on March 1966 total employment in the major industry group.
3/ Data are not available.

Note: Individual items may not add to totals because of the inclusion of benchmark data and/or rounding.

larly in the cigar industry. The expanding use of processed tobacco, composed of natural leaf materials that are finely ground and reconstituted into a continuous uniform sheet, will make possible substantial savings in material and labor in the manufacture of cigars. It is used widely as a binder and to a limited, though increasing extent, as a wrapper in place of natural leaf.

Further integration of cigar manufacturing processes also are expected. The connection of such equipment as wrapping and banding machines with cartoning machines reduces cigar handling and will adversely affect labor requirements for cigar packers. Full integration of processing equipment from cigar making through wrapping, banding, and cartoning has been accomplished in some large plants.

Cigarette manufacturing, by using highly mechanized equipment, is now a continuous process of wrapping, cutting, inspecting, and packaging. Modifications made in cigarette machines in the last decade have increased their operating speed substantially. A new type of cigarette producing machine, recently introduced in the industry, makes possible further increases in production rates. Highly efficient equipment for attaching filter plugs to cigarettes has become an integral part of the producing machine in recent years. In addition, some plants are joining producing machines in pairs, permitting a reduction of one–half in the number of operators of these machines.

Textile Mill Products [23]

Current Employment

Approximately 962,000 wage and salary workers were employed in the textile mill products major industry group in 1966. (See table 9.) About half of the employment was divided almost equally between the cotton broad woven fabrics industry segment and the knitting segment. Three other industry groups combined–yarn and thread; silk and synthetic broad woven fabrics; and finishing textiles, except wool and knit–accounted for nearly one-third of all workers. Together, the remaining four industry groups–weaving and finishing broad woolens, floor covering, narrow fabrics and small wares, and miscellaneous textile goods–employed one-fifth of the workers.

Production workers constitute approximately 89 percent of the textile workforce, considerably higher than the average for all manufacturing. Three sectors–finishing textiles, except wool and knit (85 percent); floor covering (82 percent); and miscellaneous textile goods industries (83 percent) had proportions somewhat lower than the average for the major industry group.

Women workers accounted for about 44 percent of total employment in textile mill products establishments in 1966–substantially higher than the 27 percent for all manufacturing. Among the individual industry groups, the proportion of women workers ranged from 24 percent in establishments producing finishing textiles, except wool and knit, to 68 percent in knitting establishments, where many women are employed as machine tenders.

Employment Trends and Outlook

Employment in establishments manufacturing textile products fell from nearly 1.3 million in 1947 to approximately 962,000 in 1966, or by about 26 percent. Most of the decline took place in the early part of this period. Between 1958 and 1966,[24] employment rose in seven textile mill products industry groups, but employment declines in the other two groups offset these gains. As a result, there was little change in total employment at the end of the period. The fastest rate of employment growth was recorded in the floor covering sector, where the rapidly growing demand for these products caused employment to rise by about 25 percent. This gain occurred despite the introduction of new, more efficient machines. In contrast, a relatively small change in the production of wool fabrics, combined with an increasing output per worker resulting from the use of improved looms and other laborsaving innovations, caused employment in wool weaving and finishing establishments to decline by about 21 percent.

Production workers decreased as a proportion of total employment in the textile mill products major industry group from 94 percent in 1947 to 89 percent in 1966. During the 1958-66 period, the ratio of production workers increased somewhat in the narrow fabrics and smallwares industry group and remained about the same in the yarn and thread industry group. In all other industry segments, the proportion of production workers declined.

Manpower requirements in this major industry group are expected to decline from approximately 962,000 to 880,000 between 1966 and 1975, assuming no significant changes in balances between imports and exports. Production is expected to increase during this period, stimulated by such factors as a growing population (especially teenagers and young adults who are major consumers of clothing) and rising family formations and personal disposable income (which should stimulate demand for such products as carpets and drapes as well as clothing). In addition, expenditures for research and development in the fields of synthetic fibers and natural fibers and fabrics are expected to increase. Such activities can be expected to result in new fabrics and synthetic fibers that will open new markets for textile mill products. However, the expanding output of textile mill products is expected to be more than offset by rising output per worker resulting from the greater use of laborsaving technology, such as faster, higher capacity machines; more efficient methods of materials handling; and automatic production machinery. Among the individual industry groups, employment trends are expected to differ.

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[23] SIC 22. This major group includes establishments engaged in performing any of the following operations: (1) Preparation of fiber and subsequent manufacturing of yarn, thread, braids, twine, and cordage; (2) manufacturing broad woven fabric, narrow woven fabric, knit fabric, and carpets and rugs from yarn; (3) dyeing and finishing fiber, yarn, fabric, and knit apparel; (4) coating, waterproofing, or otherwise treating fabric; (5) the integrated manufacture of knit apparel and other finished articles from yarn; and (6) the manufacture of felt goods, lace goods, bonded-fiber fabrics, and miscellaneous textiles.

[24] BLS employment (payroll) data prior to 1958 are available only for three industry groups–knitting; yarn and thread; and finishing textiles, except wool and knit.

Table 9. Distribution of Wage and Salary Workers in the Textile Mill Products Major Industry Group, by Industry, 1966

(In thousands)

SIC Code	Industry	Wage and salary workers		Production workers as percent of employment, by industry	Women workers as percent of employment, by industry
		Number	Percent distribution		
22	Textile mill products	961.5	100.0	89.1	44.4
221	Cotton broad woven fabrics	237.2	24.7	91.9	38.7
222	Silk and synthetic broad woven fabrics	97.0	10.1	90.2	35.1
223	Weaving and finishing broad woolens	45.4	4.7	87.2	35.5
224	Narrow fabrics and small wares	31.4	3.3	88.9	56.7
225	Knitting	234.4	24.4	89.5	68.4
2251	Women's full and knee length hosiery	54.2	5.6	91.5	76.0
2252	Miscellaneous hosiery and socks	42.3	4.4	91.5	72.3
2253	Knit outerwear	72.9	7.6	87.4	72.7
2254	Knit underwear	34.7	3.6	89.9	69.7
2256, 9	Knit fabrics and knitting, not elsewhere classified	1/29.7	2/3.1	(3)	(3)
226	Finishing textiles, except wool and knit	79.6	8.3	84.5	24.2
227	Floor covering	43.5	4.5	81.8	31.5
228	Yarn and thread	115.9	12.1	92.9	45.1
2281, 3	Yarn spinning	1/89.2	2/9.3	(3)	(3)
2282, 4	Yarn throwing and thread mills	1/25.5	2/2.7	(3)	(3)
229	Miscellaneous textile goods	77.2	8.0	82.6	27.8
2298	Cordage and twine	1/10.9	2/1.1	(3)	(3)
2291-7, 9	Miscellaneous textile goods, not elsewhere classified	1/66.8	2/7.0	(3)	(3)

1/ Benchmark data for March 1966.
2/ Based on March 1966 total employment in the major industry group.
3/ Data are not available.

Occupational Structure

The textile mill products major industry group contains the highest proportion of production workers among all manufacturing industries. In 1960, almost 9 out of 10 workers[25] in the industry was a blue-collar worker, the vast majority of whom were operatives.

The explanation for this high concentration of semiskilled workers lies in the nature of the production process. Although the manufacture of textile products is highly mechanized, the transformation of wool, cotton, and man-made fibers into yarn and fabric involves many individual production operations that utilize large numbers of machine tenders, such as spinners, weavers, and knitters. "Other" operatives accounted for most of the workers in the operative occupational group and nearly half of all workers in the industry. Process jobs common among "other" operatives were doffers, colorists, drying-frame operators, and loom threaders. The proportions of textile mill workers in the remaining blue-collar major occupation groups–craftsmen and laborer–were below the average for nondurables manufacturing. Nevertheless, textile mills employed significant numbers of mechanics and repairmen, loom fixers, and foremen. The proportion of textile mill workers in each white-collar major occupation group also was substantially below the average for all nondurables manufacturing. Clerical workers accounted for more than half of all white-collar workers.

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[25] Includes self-employed and unpaid family workers, as well as wage and salary workers.

Increasing use of laborsaving technological innovations, including faster and higher capacity machines, improved methods of material handling, and greater application of continuous manufacturing techniques should result in substantial changes in the industry's occupational structure by 1975 (See volume IV, appendix G.) As an example of the accelerating mechanization occurring in the industry, new carding and drawing machines now operate more than three times as fast than 10 years ago; spindle speeds were 10,000 r.p.m. in 1950, but between 13,000–20,000 r.p.m. are now possible; winding speeds are at least double that of 10-15 years ago; and loom speeds have increased substantially. Equally dramatic improvements are occurring in the capacity and speed of spinning, weaving, and other production equipment. Probably more important, the use of improved yarns results in fewer loom stops and allows operators to watch more looms with less effort.

Innovations such as these are expected to continue to reduce the proportion of operatives through the mid-1970's. The ratio of spinners and weavers will be particularly affected. Other process operatives likely to be adversely affected include card tenders, comber tenders, drawers, doffers, loom threaders, and spool winders. The ratio of knitters, however, is not expected to decline, since reduced labor requirements resulting from increased machine speeds will be offset by the continued growth of demand for knit goods–a process in which manpower requirements remain relatively high.

Employment requirements for craftsmen, particularly mechanics and repairmen, are expected to increase sharply because of the growing use of complex machines and instruments, such as devices that photoelectrically detect defects in yarn, automatically tie breaks in yarn, and control dyeing machine temperature and time.

The ratio of unskilled labor, which is only a small proportion of total jobs in the industry, will continue to be reduced by improved materials handling innovations, including powered conveyors, hoists, monorails, tramrails, and forklift trucks. Requirements for unskilled workers, such as cleaners and oilers, will also be reduced as automatic cleaning devices and central lubrication and sealed antifriction bearings are used increasingly on spinning, twisting, weaving, and other types of textile machinery.

Each of the major white-collar occupation groups is expected to constitute a larger proportion of total employment in 1975, offsetting the substantial declines in the ratios of operatives. Engineers and technicians should benefit particularly from the expanding research and development activities being conducted by larger establishments in the industry and by the greater technical requirements necessary to design, install, and maintain the increasingly complex equipment in use in the industry.

Apparel and Related Products[26]

Current Employment

Nearly 1.4 million wage and salary workers were employed in the apparel incustry group in 1966. (See table 10.) More than one-third made mens' and boys' clothing, about 30 percent made women's outerwear, and about 12 percent worked in establishments producing miscellaneous fabricated textile products. The remaining workers were employed in establishments making women's and children's undergarments; hats, caps, and millinery; girls' and children's outerwear; and fur goods and miscellaneous apparel.

Production workers accounted for 89 percent of total wage and salary employment in apparel manufacturing establishments in 1966, compared with 74 percent for all manufacturing. The proportion of production workers in the individual apparel industries varied only slightly from the average for this major industry group.

Women workers accounted for 80 percent of all wage and salary workers in apparel manufacturing establishments in 1966, considerably higher than the 27 percent average for all manufacturing. Among the individual industry groups, the proportion of women workers ranged from 65 percent in establishments manufacturing miscellaneous fabricated textiles to 87 percent in plants making women's and children's undergarments.

Employment Trends and Outlook

Employment in apparel manufacturing increased from about 1.2 million to nearly 1.4 million between 1947 and 1966. This 21 percent advance was slightly lower than the rate of increase for manufacturing.

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[26] SIC 23. This major group includes establishments producing clothes and fabricated products by cutting and sweing purchased woven or knit textile fabrics and related materials such as leather, rubberized fabrics, plastics and furs.

Table 10. Distribution of Wage and Salary Workers in the Apparel and Related Products Major Industry Group, by Industry, 1966

(In thousands)

SIC Code	Industry	Wage and salary workers		Production workers as percent of employment, by industry	Women workers as percent of employment, by industry
		Number	Percent distribution		
23	Apparel and related products	1,398.8	100.0	88.9	79.8
231	Men's and boys' suits and coats	122.9	8.8	89.3	70.6
232	Men's and boys' furnishings	370.6	26.5	90.4	84.6
2321	Men's and boys' shirts and nightwears	130.9	9.4	90.5	88.2
2322	Men's and boys' nightwear	1/17.0	2/1.2	(3)	(3)
2323, 9	Men's and boys' clothing, not elsewhere classified	1/61.3	2/4.4	(3)	(3)
2327	Men's and boys' separate trousers	79.1	5.7	93.7	81.7
2328	Work clothing	81.9	5.9	89.3	84.1
233	Women's, misses', and juniors' outerwear	423.5	30.3	89.4	83.2
2331	Women's blouses, waists, and shirts	53.9	3.9	91.3	88.7
2335	Women's, misses', and juniors' dresses	201.1	14.4	89.6	85.5
2337	Women's suits, skirts, and coats	89.0	6.4	89.7	72.8
2339	Women's and misses' outerwear not elsewhere classified	79.6	5.7	87.3	85.3
234	Women's and children's undergarments	125.2	9.0	88.3	86.7
2341	Women's and children's underwear	81.7	5.8	90.5	88.4
2342	Corsets and allied garments	43.5	3.1	84.6	83.7
235	Hats, caps, and millinery	28.0	2.0	88.9	67.5
236	Girls' and children's outerwear, etc.	80.2	5.7	89.5	85.5
2361	Children's dresses, blouses, and shirts	35.4	2.5	90.7	88.7
2363, 9	Girls' and children's outerwear, etc.	1/45.0	2/3.2	(3)	(3)
237, 8	Fur goods and miscellaneous apparel	79.5	5.7	86.7	72.7
237	Fur goods	1/ 8.3	2/0.6	(3)	(3)
2381	Dress and work gloves, except knit and all leather	1/15.4	2/1.1	(3)	(3)
2384-7, 9	Miscellaneous apparel and accessories, not elsewhere classified	1/53.5	2/3.8	(3)	(3)
239	Miscellaneous fabricated textiles	169.0	12.1	84.9	64.7
2391, 2	Housefurnishings	60.8	4.3	85.7	73.0
2393	Textile bags	1/ 9.1	2/0.7	(3)	(3)
2394-7, 9	Miscellaneous fabricated textile products, not elsewhere classified	1/96.8	2/6.9	(3)	(3)

1/ Benchmark data for March 1966.

2/ Based on March 1966 total employment in the major industry group.

3/ Data are not available.

Note: Individual items may not add to totals because of the inclusion of benchmark data and/or rounding.

Production rose by 103 percent, compared with an increase of 139 percent in all manufacturing production.

Between 1958 and 1966,[27] employment trends varied considerably among the different apparel industry groups, reflecting factors such as the needs of different age groups in a changing population and the increasing demand for casual wear. Employment grew most rapidly in miscellaneous fabricated textile products establishments, whose products include curtains, draperies, and other textile housefurnishings required by the growing numbers of young adults establishing homes. A significant increase in the number of workers making men's and boys' furnishings is attributed to the growing preference for casual wear. By contrast, a very small rise in the employment of workers making men's and boys' suits and coats reflects the decline in popularity of more formal wear. The substantial drop in the number of workers making hats, caps, and millinery is further evidence of waning demand for formal attire.

Production workers as a proportion of total wage and salary employment in apparel establishments decreased from 91 percent in 1947 to 89 percent in 1966. The proportions of production workers to total employment within the individual industry groups changed very little, although miscellaneous and fabricated textile establishments showed a small increase.

Assuming no significant changes of relative trends in the importance of apparel imports and exports over the decade ahead, manpower requirements in this industry are expected to be more than 1.5 million in 1975 or about 9 percent above the 1966 level. (See volume IV, appendix B.) The annual rate of growth implied by the projection is slightly higher than the annual rate between 1955 and 1966.

The anticipated employment expansion is based on a rapidly rising demand for apparel from a growing, more affluent, and younger population. Growth in population and personal disposable income should contribute substantially to an increasing demand for apparel and fabricated textile products for the home. Of particular importance is the anticipated increase in the proportion of the population ages 14 to 34–generally the largest consumers of apparel. Those in this age group are expected to increase as a proportion of the population by about one-seventh over the decade ahead.

Technological developments in the apparel industry during the next decade are expected to have relatively limited impact on employment requirements. Although mechanization of many of the production operations in this industry is technically feasible, mechanized equipment has generally lacked the flexibility required to adjust to seasonal changes in styling and shifts in style trends. Moreover, although apparel firms are becoming larger, most firms in the industry are still small and lack the capital to invest in expensive equipment. Nevertheless, due to increases in the size of apparel firms and rising research and development expenditures to improve apparel production operations, a gradual increase in the use of mechanized equipment and other laborsaving devices is anticipated in this industry. Most new highly mechanized equipment will be used in the sewing, cutting, and pressing operations of large plants.

Occupational Structures

In apparel manufacturing, the number of production operations on a garment is large, production runs are short, and firms tend to be small and often undercapitalized. This industry structure is not conducive to widespread use of automatic production equipment, and accordingly, the industry is one of the least automated of all manufacturing industries. Apparel manufacturing is characterized by a great variety of sewing operations requiring a large number of operatives, each of whom typically performs a relatively simple sewing task (See volume IV, appendix G.) In 1960, more than 3 out of 4 persons employed in apparel manufacturing was an operative. Nearly half of the operatives were sewers, either sewing machine operators, who predominated, or hand stitchers. The remaining miscellaneous operatives were workers such as thread trimmers, form makers, clothing cutters, and hand pressers.

The large number of small firms engaged in apparel manufacturing is reflected in the relatively small proportion of white-collar workers employed in 1960, particularly professional and technical workers.

The most significant shift over the next decade in the occupational structure of the apparel industry will be the decline in the proportion of operatives. A continuing shift from skilled hand operations (tailor system) to the section system, which utilizes much single purpose machinery, is expected to result in a decline in the relative employment of stitchers. However, this decline will be somewhat offset by the growing demand for expensive, styled garments, requiring custom work.

In the cutting room, greater use of automatic die cutting machines is expected to reduce the proportion of cutters required, and the application of jets of steam through mannequins, or forms, is expected to reduce the ratio of pressers to total employment in the industry.

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[27] BLS employment (payroll) data for 3 industry groups–hats, caps, and millinery; fur goods and miscellaneous apparel; and miscellaneous fabricated textile products–are not available for years prior to 1958.

On the other hand, expanding use of more complex, special purpose machinery is expected to increase the need for mechanics and repairmen, and they should make up a higher proportion of the industry's work force by 1975. In addition, the greater use of new and improved material handling equipment will reduce the ratio of laborers.

The trend toward larger and better capitalized apparel firms will likely reduce the percentage of managers, officials, and proprietors in the industry; however, the need for highly trained managerial workers, such as personnel and labor relations specialists, will increase. The requirements for engineers and technicians needed to perform industrial engineering tasks, such as time studies, plant layouts, and work flow analyses, will increase. Workers having special training also may be required for curing and testing jobs in rapidly expanding "durable press" operations.

Lumber and Wood Products, Except Furniture [28]

Current Employment

Approximately 613,000 wage and salary workers were employed in the lumber and wood products major industry group, except for furniture, in 1966. (See table 11.) About 40 percent worked in establishments engaged primarily in sawing and planing lumber, and 28 percent were employed in establishments producing millwork, plywood, and prefabricated structural wood products. Smaller numbers of workers were employed in logging camps and by logging contractors (13 percent) and by miscellaneous wood products establishments (13 percent). The remaining workers were in establishments producing wooden containers.

Production workers accounted for 87 percent of total employment in this major industry group in 1966, compared with 74 percent for all manufacturing. The proportion of production workers was slightly higher than the average for the major industry group in establishments producing wooden containers and in sawmills and planing mills, and slightly lower in the remaining industry groups.

Women workers accounted for 8 percent of total employment in this major industry, substantially lower than the 27 percent for all manufacturing. Among the individual industry groups, the proportion of women workers varied considerably, ranging from slightly less than 4 percent of total employment in logging camps and logging contractors and in sawmills and planing mills, to more than 20 percent in establishments producing miscellaneous wood products.

Employment Trends and Outlook

Employment in the lumber industry fell from 845,000 to 613,000 between 1947 and 1966, a decline of more than one-fourth. Employment in total manufacturing increased by 23 percent during the same period. Production rose by more than one-third, considerably slower than the rate of increase in total manufacturing production.

During the 1947-66 period, employment changes varied widely among the individual industry groups. For example, employment declined by almost one-half in sawing and planing establishments and by more than one-half in establishments producing wooden containers. The decline of employment in sawmills and planing mills was the result of increasing mechanization, improved plant layout, and a reduction in the number of establishments. These developments were more than sufficient to offset the increase in the production of lumber. Employment also declined in establishments producing wooden containers, primarily as a result of a decline in the demand for these products. Logging camp and logging contractor employment declined only slightly between 1947 and 1966.

Employment in establishments producing millwork, plywood, and related products increased substantially, primarily because of growing demand for products produced in these establishments for use in construction and manufacturing. Employment in establishments producing miscellaneous wood products also increased substantially between 1958 and 1966, again reflecting strong demand from the construction industry for wood products, especially particle board.

Production workers decreased as a proportion of total employment in this major industry group, from 93 percent in 1947 to 87 percent in 1966. The rate of decline within individual industry groups was about the same as in the major industry group.

Manpower requirements in the lumber and wood products major industry group, except for furniture, are

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[28] SIC 24. This major group includes logging camps engaged in cutting timber and pulpwood; merchant sawmills, lath mills, shingle mills, cooperate stock mills, planing mills, and plywood mills and veneer mills engaged in manufacturing finished articles made entirely or mainly of wood or wood substitutes.

Table 11. Distribution of Wage and Salary Workers in Lumber and Wood Products, except Furniture, Major Industry Group, by Industry, 1966

(In thousands)

SIC Code	Industry	Wage and salary workers		Production workers as percent of employment, by industry	Women workers as percent of employment, by industry
		Number	Percent distribution		
24	Lumber and wood products, except furniture	612.6	100.0	87.3	8.4
241	Logging camps and logging contractors	81.3	13.3	(3)	3.7
242	Sawmills and planing mills	244.9	40.0	91.2	4.3
2421	Sawmills and planing mills, general	205.4	33.5	91.1	3.8
2426, 9	Special product sawmills and planning mills	1/39.6	2/6.6	(3)	(3)
243	Millwork, veneer, plywood, and related products	171.3	28.0	84.0	8.9
2431	Millwork	70.8	11.6	80.4	9.9
2432	Veneer and plywood	81.0	13.2	91.2	8.3
2433	Prefabricated wooden buildings and structural members	1/18.3	2/3.0	(3)	(3)
244	Wooden containers	35.5	5.8	89.9	17.7
2441, 2	Wooden boxes, shook, and crates	27.4	4.5	90.1	18.2
2443, 5	Wooden containers, except boxes and crates	1/ 8.0	2/1.3	(3)	(3)
249	Miscellaneous wood products	79.6	13.0	85.7	20.4

1/ Benchmark data for March 1966.
2/ Based on March 1966 total employment in the major industry group.
3/ Data are not available.

Note: Individual items may not add to totals because of the inclusion of benchmark data and/or rounding.

expected to decline by 10 percent between 1966 and 1975, falling from 613,000 to about 550,000. Despite anticipated increases in demand for lumber and wood products resulting from rising levels of construction and manufacturing activity, employment is expected to decline due primarily to increased output per worker. In addition, the lumber industry's small but growing research and development programs are expected to increase the markets for many wood products.

Employment trends for the individual lumber and wood products industry groups are expected to differ. (See volume IV, appendix B.) Despite increasing demand for millwork, plywood, and related products, employment in establishments manufacturing these products will remain relatively stable. Items such as wooden panels, plywood, and millwork are expected to be in much greater demand in the future, reflecting a greater use by construction and manufacturing industries. However, manpower requirements will not grow as fast as output because more highly mechanized plants are expected to be in operation.

Employment requirements in establishments producing miscellaneous wood products also are expected to remain relatively stable through the mid-1970's. The rising demand for products of this industry group, particularly for particle board, is expected to be offset by increasing output per worker resulting from greater mechanization.

Manpower requirements in sawmills and planing mills are expected to continue to decline as the impact of laborsaving innovations, such as conveyor belts, electronic sorting devices, and higher speed equipment, increases operating efficiency and more than offsets increased output. In addition, plywood and veneer products are expected to continue capturing markets from lumber, thus limiting growth in the demand for lumber.

Employment in logging camps and by logging contractors is expected to decrease moderately between 1966 and 1975. Although demand is expected to accelerate for many types of forest products, continuing improvements in the harvesting and transporting of logs will tend to limit manpower needs.

Employment in establishments producing wooden containers is expected to fall slowly through the mid-1970's. Containers made of metal, plastic and paperboard will continue to offer strong competition to wooden containers in the years ahead, especially since these substitute containers are generally lighter and more durable. Manpower needs in these establishments also will tend to be limited by increasing mechanization.

Occupational Structure

In 1960, blue-collar workers accounted for about 87 percent of the work force in the lumber and wood products industry. (See volume IV, appendix G.) Operatives and kindred workers alone accounted for nearly 4 out of 10 employees. Within this group, truck and tractor drivers was the largest occupation. Most of the remaining workers were operators of specialized machines and equipment, such as sawyers, planers, feeders, press operators, etc. Laborers accounted for over one-third of total employment. In the logging sector, laborers, mostly lumbermen and wood choppers, made up over 70 percent of the work force. Craftsmen, foremen, and kindred workers represented about one-eighth of the industry's employment in 1960. Important skilled occupations were carpenters, foremen, inspectors, mechanics and repairmen. Employment in white-collar occupations accounted for less than 15 percent of all this industry's workers in 1960. Most of the white-collar workers were employed either in managerial or clerical occupations.

Important advances in technology are expected in both the logging and wood processing sectors. New highly mechanized plants for the production of plywood and veneers are being built to replace older, less efficient establishments. Higher powered and more mobile logging equipment is being increasingly used and will reduce the size of log cutting crews. In sawing and planning operations, the greater use of conveyors, sorting devices, and faster speed equipment will increase production and lower unit labor requirements. An especially sharp decrease in labor requirements will occur in the area of manual material movement.

Moderate changes in the occupational structure are expected during the 1960-75 period as growing mechanization, increasing establishment size, and shifts in employment size of the industry segments all influence the industry's occupational structure. The most significant change will be the decline in the need for unskilled laborers. A substantial drop in the proportion of these workers is expected in both sectors of the industry. In the logging sector, larger and more powerful tree cutting equipment will reduce the need for lumbermen and wood choppers. In the lumber and wood processing sector, mechanization of material movement operations and general plant modernization will decrease the need for material movement laborers, machine operators' helpers, and other unskilled workers. Offsetting this decline in laborer employment will be a growth in the proportion of semiskilled operatives needed to operate and monitor the new machinery and equipment. The proportion of truck and tractor drivers also will increase. Additional drivers will be needed to transport the logs from the timber tracts to mills. The sharpest increase in driving requirements will occur in the logging of pulpwood. A large share of pulpwood logging is conducted on smaller and more widely dispersed timber tracts where transportation requirements are greater. The proportion of mechanics and repairmen will increase as a result of the more extensive use of modern complex machinery and equipment.

Few changes are expected in the white-collar occupations. The proportion of clerical workers will increase. This gain will result primarily from the movement towards larger establishments where clerical staff account for a greater share of the work force. The decrease in small marginal logging and sawmill operations also will result in a slight drop in the proportion of managers, officials, and proprietors. This decrease will be sharpest for the self-employed owner-operators.

Furniture and Fixtures[29]

Current Employment

Nearly 462,000 wage and salary workers were employed in the furniture and fixtures major industry group in 1966. (See table 12.) Over 70 percent worked in establishments producing household furniture, such as sofa beds, studio couches and mattresses, and bedsprings. One-tenth of the workers were employed in establishments engaged in manufacturing partitions, shelving, lockers, and office and store fixtures. Another 10 percent were employed in establishments producing public building and related furniture and miscellaneous furniture and fixtures. The remaining workers were employed in establishments making office furniture.

Production workers accounted for 83 percent of total employment in 1966, compared to 74 percent for manufacturing as a whole. Among the individual industry groups, the proportion of production workers ranged from 74 percent in establishments manufacturing partitions and office and store fixtures to 85 percent in the household furniture industry group.

Women workers accounted for 20 percent of total employment in furniture and fixtures establishments in 1966, compared with 27 percent in all manufacturing. Within the individual industry groups, the proportion of women workers varied greatly. Women workers accounted for only 10 percent of the work force in establishments manufacturing partitions and office and store fixtures, whereas in establishments producing other furniture and fixtures, they constituted nearly 25 percent.

Employment Trends and Outlook

Employment in establishments manufacturing furniture and fixtures increased from 336,000 to about 462,000 between 1947 and 1966, or approximately 38 percent, more than 1½ times as fast as all manufacturing employment. During the same period, production rose by 154 percent, a rate higher than the 139 percent increase for total manufacturing production.

Between 1958 and 1966,[30] the employment growth among the industries of this major group was similar. The greatest rate of employment increase, 38 percent, occurred in establishments producing office furniture. Employment grew by 26 percent in establishments manufacturing household furniture; by 32 percent in the partitions and office and store fixtures industry group; and by about 30 percent in establishments producing other furniture and fixtures.

Manpower requirements in this major industry group are expected to increase by almost 10 percent between 1966 and 1975, from 462,000 to about 510,00. (See volume IV, appendix B.) Demand for this major industry group's products is expected to increase rapidly during the next decade. However, the increasing application of technological developments, such as automatic profilers and roisters and larger factory size, will tend to increase the efficiency of production and limit employment growth. Demand for household furniture will be stimulated by factors such as continued increases in population, new family formations, and rising disposable personal income. The anticipated increase in construction of commercial, industrial, and public buildings will contribute to high levels of demand for furniture, fixtures, and partitions.

Occupational Structure

Blue-collar workers accounted for over 8 out of 10 workers in the furniture and fixtures major industry group in 1960 (see volume IV, appendix G.), a high ratio for durable manufacturing. The large amount of general and special purpose machinery used to produce the products of this major industry group require large numbers of semiskilled workers. For this reason, operatives accounted for a very large proportion of employment—more than 50 percent. Craftsmen represented about 1 out of 5 workers. Large numbers of skilled cabinetmakers and upholsterers were employed, reflecting the continuing importance of hand craftsmenship in this major industry group. Compared to most manufacturing industries, a lower proportion of mechanics and repairmen were employed in this industry, due mainly to the simple and durable nature of much of the machinery and equipment used. Laborers made up about 6 percent of employment, while professional, technical, and service workers accounted for most of the remaining employment.

In general, the occupational structure is not expected to change appreciably by 1975, but the application of

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[29] SIC 25. This major group includes the manufacture of household, office, public building, and restaurant furniture; and the manufacture of office and store fixtures.

[30] BLS employment (payroll) data for all furniture industry segments are available only for the years since 1958. However, data for two segments are available for earlier periods–since 1947 for household furniture and since 1951 for the partitions and office and store fixture segment.

Table 12. Distribution of Wage and Salary Workers in the Furniture and Fixtures Major Industry Group, by Industry, 1966

(In thousands)

SIC Code	Industry	Wage and salary workers		Production workers as percent of employment, by industry	Women workers as percent of employment, by industry
		Number	Percent distribution		
25	Furniture and fixtures	461.7	100.0	82.9	20.0
251	Household furniture	328.1	71.1	85.4	21.5
2511	Wood house furniture not upholstered	172.2	37.3	88.7	17.8
2512	Wood house furniture upholstered	82.4	17.8	83.3	26.7
2515	Mattresses and bedsprings	37.9	8.2	79.2	27.2
2514, 9	Metal household furniture and household furniture, not elsewhere classified	1/35.8	2/7.9	(3)	(3)
252	Office furniture	34.8	7.5	78.2	13.8
253	Public building and related furniture	1/27.3	2/6.0	(3)	(3)
254	Partitions, office and shelving, store fixtures, lockers	47.2	10.2	74.2	10.0
259	Miscellaneous furniture and fixtures	1/22.9	2/5.1	(3)	(3)
253, 9	Other furniture and fixtures	51.6	11.2	77.7	24.6

1/ Benchmark data for March 1966.
2/ Based on March 1966, total employment in the major industry group.
3/ Data are not available.

Note: Individual items may not add to totals because of the inclusion of benchmark data and/or rounding.

new technology will have a significant impact on requirements for some occupations. For example, the increasing use of automatic machinery, such as automatic routers, and the more extensive use of specialized semiskilled workers in the woodworking process is expected to reduce requirements for cabinetmakers. The proportion of upholsterers is expected to decline as the use of improved power-driven fastening equipment, such as nailers, staplers, tackers, and clippers, becomes more widespread. Partially off-setting the decrease in the proportion of cabinetmakers and upholsterers in the craftsman category, will be an increase in the proportion of foremen, mechanics, and repairmen. Foremen are expected to increase proportionately because of the needed for closer supervision of production and inspection processes required by the greater use of automatic equipment. The growth in mechanization also will increase the requirements for mechanics and repairmen need to maintain the more sophisticated equipment. The proportion of laborers is expected to decrease by about one-third as automatic stockers, conveyors, and hoppers replace the unskilled workers in transferring materials between machines and work areas. The trend to larger size companies is expected to further reduce requirements for laborers by increasing the potential for capital investment in plant mechanization.

Paper and Allied Products[31]

Current Employment

About 668,000 wage and salary workers were employed in the paper and allied products major industry group in 1966. (See table 13.) More than two-fifths worked in establishments manufacturing pulp, paper, and paperboard. Nearly one-third were in establishments making paperboard containers and boxes, including folding and set-up paperboard boxes; corrugated and solid fiber boxes; sanitary food containers; and fiber cans, tubes, and drums. The remaining workers were employed in establishments producing converted paper products, such as coated and glazed papers, envelopes, and sanitary paper products.

Production workers accounted for 78 percent of total wage and salary employment in this major industry group in 1966, slightly higher than the 74 percent in manufacturing as a whole. Women workers accounted for about 21 percent of all wage and salary employment in paper and allied products establishments, compared with 27 percent in all manufacturing. Among the individual industry groups, the proportion of women workers ranged from 9 percent of the work force in establishments producing paperboard to 36 percent in establishments manufacturing converted paper and paperboard products.

Employment Trends and Outlook

Employment in establishments manufacturing paper and allied products increased from 465,000 to about 668,000 between 1947 and 1966, or approximately 44 percent. This increase was almost twice as fast as the employment growth in all manufacturing over the 19 year period. During the same period, production rose by 128 percent, somewhat slower than total manufacturing production.

Between 1958 and 1966,[32] employment growth among the various segments of this major industry group differed widely, reflecting in part differences in the rates of increase in product demand and the introduction of laborsaving technology. For example, employment increased by more than two-fifths in establishments producing converted paper and paperboard products, except containers and boxes. Additional plants and workers were needed during this period to meet the rapidly increasing demand for this industry's products, particularly for coated and processed papers, sanitary tissue health products, and grocers' multiwall bags. However, employment did not rise as fast as production because of the increasing use of more efficient production techniques and equipment, including automatic packaging machines, conveyor systems, mechanized baling operations, and multioperation printing and folding machines. On the other hand, employment in establishments producing pulp, paper, paperboard, and building paper and board remained relatively unchanged. Rising production was largely offset by higher output per worker resulting from the growing use of more efficient production machinery, including machines that produce paper at higher speeds and of greater width than older equipment.

Production workers decreased as a proportion of total employment in this major industry group, from 87 percent in 1947 to 78 percent in 1966, mainly because of increasing mechanization of production operations. The rate of decline was much slower in establishments producing paperboard containers and boxes than in the other three industry groups.

Manpower requirements in establishments making paper and allied products are expected to increase by more than one-fifth between 1966 and 1975, rising from about 668,000 to 775,000. Employment will be spurred by increased production of paper and paper products, which is expected to rise rapidly through the mid-1970's, stimulated by population growth, general business expansion, and rising per capita consumption of paper products. Growing outlays for research and the development of new products and the application of existing products to new markets also are expected to increase production and employment. For example, a new technique has recently been developed for laminating draft paper to very thin sheets of steel, which can be used in corrugated shipping containers. New paper products introduced recently or to be introduced shortly include industrial wipes, stretchable grocery and refuse bags, and improved paper textiles and clothing for men and women. However, accelerating output of paper and

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[31] SIC 26. This major group includes the manufacture of pulps from wood and other cellulose fibers, and rags; the manufacture of paper and paperboard; and the manufacture of paper and paperboard into converted products such as paper coated off the paper machine, paper bags, paper boxes, and envelopes.

[32] BLS (payroll) employment data for two industry groups–paperboard mills, and converted paper and paperboard products, except containers and boxes–are not available for years prior to 1958.

Table 13. Distribution of Wage and Salary Workers in the Paper and Allied Products Major Industry Group, by Industry, 1966

(In thousands)

SIC Code	Industry	Wage and salary workers		Production workers as percent of employment, by industry	Women workers as percent of employment, by industry
		Number	Percent distribution		
26	Paper and allied products	667.5	100.0	77.8	21.2
261, 2, 6	Paper and pulp	215.2	32.2	79.0	11.2
263	Paperboard	71.8	10.8	78.6	8.6
264	Converted paper and paperbroad products	171.7	25.7	73.3	35.5
2643	Bags, except textile bags	40.0	6.0	80.5	36.0
2641, 2, 4-6, 9	Other converted pulp and paperboard products, not elsewhere classified	1/127.0	2/19.4	(3)	(3)
265	Paperboard containers and boxes	208.8	31.3	79.9	24.0
2651, 2	Folding and setup paperboard boxes	65.6	9.8	82.9	34.3
2653	Corrugated and solid fiber boxes	97.3	14.6	77.4	14.4
2654	Sanitary food containers	1/ 30.0	2/ 4.6	(3)	(3)
2655	Fiber cans, tubs, drums, and similar products	1/ 15.2	2/ 2.3	(3)	(3)

1/ Benchmark data for March 1966.
2/ Based on March 1966, total employment in the major industry group.
3/ Data are not available.

Note: Individual items may not add to totals because of the inclusion of benchmark data and/or rounding.

allied products is expected to be partly offset by rising output per worker resulting from the greater use of laborsaving technology, such as huge continuous digesters used in pulp making, and computers to control production operations. Employment in the paperboard containers and boxes segment is expected to increase faster than the average for the major industry group, despite significant increases in output per worker. (See volume IV, appendix B.)

Occupational Structure

The production of paper and allied products involves the use of highly complex machines, as well as many machines that perform only one operation. In addition, powered equipment and hand labor are required to move materials and pack and crate finished products. Because of the manner in which paper and allied products are produced, the industry employs a relatively high proportion of blue-collar workers. In 1960, about half of the workers[33] were operatives (see volume IV, appendix G), the highest proportion being in establishments that produced paperboard containers and boxes where many production operations were completed by machines that performed only a single operation. The proportion of craftsmen in establishments producing paper and allied products was somewhat above the average in nondurable industries because of the relatively greater need in plants making pulp, paper, and paperboard for millwrights, machinists, and mechanics to install, maintain, and repair the highly complex production equipment; for cranemen to move raw materials and finished products; and for carpenters, electricians, and plumbers to perform plant maintenance. Such plants also employed twice the proportion of laborers as did nondurable establishments, on the average, mainly because of the importance of materials handling activities.

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[33] Including self-employed and unpaid family workers, as well as wage and salary workers.

The ratio of white-collar workers in the paper and allied products major industry group was substantially below the average for manufacturing in 1960. However, the proportions of white-collar workers in the individual industry groups differed significantly, reflecting differences in production operations, average establishment size, and other factors. For example, professional and technical workers accounted for a larger share of total employment in pulp, paper, and paperboard establishments than in the other paper and allied products industries because of the more complicated production process and, therefore, the greater need for engineers, chemists, and other technical workers. The proportion of managers was highest in plants producing other paper products, largely because of the many small establishments in this industry segment. Other paper products plants also had the largest share of clerical workers, reflecting the large number of outlets these plants have for a great variety of paper products and, therefore, the need for a relatively large number of workers in recordkeeping operations.

The occupational structure of the paper and allied products major industry group is expected to change substantially by 1975. The increasing use of laborsaving equipment will be a factor contributing to this change. More widespread use of such innovations as electronically controlled continuous digesters, more efficient papermaking machines, and instruments to monitor and control papermaking operations should cause a decline in the proportion of operatives. This decline is expected to be particularly sharp in plants producing pulp, paper, and paperboard, where continuous flow processing and centralized control systems are expected to be used increasingly. In the converted paper products and the paperboard containers and boxes industry groups, requirements for workers, such as hand-feed machine operators and materials handlers and packers, will continue to be affected adversely by the growing use of automatic packaging machines; conveyor systems; multioperation cutting, creasing, and stripping machines; multioperation printing and folding machines; palletizing; and mechanized baling operations. Comparable technological developments in each of the other industry segments is expected to cause the ratio of such workers as materials handlers and other laborers to drop sharply by 1975.

On the other hand, more widespread use of electronic instruments, such as the radioisotope (beta) gage and other complex machinery, should increase requirements for skilled maintenance mechanics and instrument repairmen. The ratio of printing craftsmen also will increase because of the trend toward printing at converting establishments.

The proportion of professional and technical workers is expected to rise because of increasing requirements for such workers in research and development activities and in the modernization and expansion of production facilities. The growing use of more complex production machinery and instruments and other control devices, including computers, will result in increased needs for technicians. The proportions of designers and artists—workers who determine the construction and appearance of paper products—also are expected to increase.

Printing, Publishing, and Allied Industries[34]

Current Employment

Over 1.0 million wage and salary workers were employed in the printing, publishing, and allied industries major industry group in 1966. (See table 14.) Over one-third worked in newspaper publishing and printing establishments, while almost another one-third were employed in commerical printing establishments. The remaining workers were employed in establishments that publish and print books or periodicals; and in other printing and publishing industries, such as those producing business forms or greeting cards, or providing typesetting, photoengraving, platemaking, and bookbinding services to the printing trades. Production workers accounted for approximately 64 percent of total employment in this major industry group in 1966, compared with 74 percent for all manufacturing. The proportion of production workers among the individual

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[34] SIC 17. This major industry group includes establishments engaged in printing by one or more of the common processes, such as letterpress, gravure, or screen; and those establishments that perform services for the printing trade such as typesetting, photoengraving, platemaking, and bookbinding. This major group also includes establishments engaged in publishing books, newspapers, and periodicals, regardless of whether or not they do their own printing.

Table 14. Distribution of Wage and Salary Workers in Printing, Publishing, and Allied Industries Major Industry Group, by Industry, 1966

(In thousands)

SIC Code	Industry	Wage and salary workers		Production workers as percent of employment, by industry	Women workers as percent of employment, by industry
		Number	Percent distribution		
27	Printing, publishing, and allied industries	1,021.8	100.0	63.6	30.0
271	Newspaper printing and publishing	353.1	34.6	50.5	22.9
272	Periodical printing and publishing	71.7	7.0	35.4	48.0
273	Book printing and publishing	89.3	8.7	61.9	44.3
275	Commercial printing (total	322.8	31.6	78.5	25.6
2751	Commercial printing except lithographic)	204.2	20.0	79.5	24.9
2752	Commercial printing lithographic	107.4	10.5	76.4	25.9
2753	Engraving and plate printing	1/11.1	2/1.1	(3)	(3)
277	Greeting cards	1/22.5	2/2.2	(3)	(3)
278	Bookbinding	54.9	5.4	82.5	48.1
274, 6, 9	Other printing and publishing, not elsewhere classified	1/103.0	2/10.3	(3)	(3)

1/ Benchmark data for March 1966.
2/ Based on March 1966, total employment in the major industry group.
3/ Data are not available.

Note: Individual items may not add to totals because of the inclusion of benchmark data and/or rounding.

industry groups varied considerably, ranging from 35 percent in periodical publishing and printing, to nearly 83 percent in establishments engaged in bookbinding and related activities.

Women workers accounted for 30 percent of total employment in the printing, publishing and allied industries major industry group in 1966, only slightly higher than the 27 percent in all manufacturing. Among the individual industry groups, the proportion of women workers ranged from 23 percent in newspaper publishing and printing to 48 percent in periodical publishing and printing.

Employment Trends and Outlook

Employment in printing, publishing, and allied industries rose from 721,000 in 1947 to about 1,022,000 in 1966, and increase of 42 percent. This increase was three-fourths greater than the gain in all manufacturing. During the same period, production in this major industry group rose by 87 percent.

Between 1947 and 1966,[35] employment growth differed considerably among the segments comprising this major industry group. Employment growth was most rapid (117 percent) in the lithographic segment of the commercial printing industry. The introduction of more durable printing plates and larger, faster, web-offset presses increased significantly the application of the lithographic process to large scale production. Employment in the book printing and publishing industry increased by 76 percent, despite the expanding application of laborsaving technology. Growth was stimulated by the increasing demand for books by schools, colleges, and individuals. Employment in the newspaper printing and publishing industry increased by about 42 percent between 1947 and 1966, however, most of this increase occurred between 1947 and 1958.

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[35] BLS employment (payroll) data for total commercial printing are not available for years prior to 1958, but data for commercial printing except lithographic and commercial printing lithographic are available from 1947.

The decline in the rate of employment growth since 1958 reflects the increasing use of modern printing technology, such as automated typesetting processes, photocomposition, mechanized plate-casting equipment, and the greater use of more mechanized materials handling equipment. In addition, the decrease in the total number of large metropolitan dailies, and the growing practice of many small newspapers to contract with larger newspapers or other printing firms to do their printing, has contributed to the decline in the rate of employment growth of this industry group in recent years.

Employment in the periodical printing and publishing industry has been stable. Production increases in this industry were achieved by little change in employment, primarily because of the growing practice of hiring commerical printing establishments to print the periodicals.

Production workers declined as a proportion of total employment in the printing, publishing, and allied industries major industry group from about 68 percent in 1947 to about 64 percent in 1966, reflecting the increasing mechanization of production operations. The decline in the proportion of production workers in the individual industries generally followed the same pattern, except for the book printing and publishing and the bookbinding industries in which the proportions of production workers remained unchanged.

Manpower requirements in this major industry group are expected to increase by about 12 percent between 1966 and 1975, rising from about 1.0 to 1.1 million. (See volume IV, appendix B.) Primary factors that are expected to contribute to employment growth include expanding school enrollments; increasing Federal aid to education; higher consumer expenditures for books and periodicals; greater use of prepackaged goods, including printed cartons, labels, and wrappers; rapidly growing use of business forms; and increasing emphasis on advertising and other printed materials stimulated by the general growth of the economy. However, the growth of employment requirements will be somewhat limited by the continuing use of laborsaving technological developments in printing production equipment, such as computer–controlled typesetting equipment, more highly mechanized plate-casting equipment, faster press speeds, and more mechanized bindery equipment.

Employment trends among the industries constituting the printing, publishing, and allied industries major industry group are expected to differ. Employment in newspaper publishing and printing is expected to decline slightly as efficiency in typesetting, plate-making, and finishing operations increases. In all other segments of the printing and publishing industry, manpower requirements are expected to increase because of the anticipated rapid growth in demand for printed materials.

Occupational Structure

The printing industry requires a highly skilled production work force. In 1960, craftsmen, foremen, and kindred workers accounted for nearly 3 out of 10 workers in the industry, (see volume IV, appendix G) the highest proportion of any major industry group found in nondurable goods manufacturing. Most of the craftsmen were employed in one of the highly skilled printing trades. Together, the printing trade occupations accounted for nearly one-fourth of the industry's work force. In 1960, compositors and typesetters was the largest single occupational classification, representing nearly one-half of all the craftsmen employed in the industry. Other important skilled printing occupations were pressmen and printers, photoengravers and lithographers, and electrotypers and stereotypers. Operatives and kindred workers accounted for most of the remaining blue-collar workers, accounting for 1 out of 8 workers in 1960. These semiskilled workers were largely concentrated in finishing occupations, such as bindery hand, collator, wrappers, bundler, and packer.

Sales workers accounted for nearly one-fifth of the industry's work force in 1960. Newspaper delivery boys made up over 90 percent of the sales workers. Clerical workers also accounted for about one-fifth of the industry's employment. The largest clerical occupation was stenographers, typists, and secretaries. Many other workers were employed in specialized clerical occupations, such as ad takers, copyboys, proofreaders, and subscription and circulation clerks. The occupational groups comprising the managers, officials, proprietors, and professional workers each accounted for nearly one-tenth of the industry's work force. Editors and reporters, largely concentrated in newspaper printing, accounted for nearly two-thirds of all the professional workers.

A number of important changes in the occupational structure of this industry are expected during the 1960-75 period. The most significant changes will occur in the printing craft occupations. Technological changes, coupled with shifts in industry structure, will cause diverse trends among these occupations. The growing use of computers to control typesetting, together with the increasing speeds of typesetting equipment, will substantially reduce the proportion of compositors and typesetters required by the industry. The growing use of the offset printing process for the printing of newspapers also will lessen the need for compositors and typesetters. Many small newspapers and a greater share of all advertisements are being printed by the offset process. On the other hand, the proportion of photoengravers and lithographers in the industry is expected to increase. The expanding use of the offset process in newspaper printing, together with the rapid employment growth expected in the book publishing and printing sector of the industry, where these workers make up a larger share of the work force, will raise the employment requirements for these skilled craftsmen. The ratio of pressmen and plate printers will remain relatively constant as their lower unit labor requirements, resulting from increases in press speeds, are offset by the growth expected in the volume of printing.

The manpower requirements for electrotypers and stereotypers are expected to decline substantially during the 1960-75 period. The introduction of new platemaking equipment will result in a substantial reduction in the proportion of these skilled craftsmen needed in the industry. Some increase in the ratio of operatives is expected. The sharp rise of employment in book printing and publishing, where a large share of the bindery and finishing workers are employed, will more than offset the additional mechanization expected in these operations.

Few major occupational structure changes are expected in the white-collar occupations. Sales workers will slightly increase their share of the industry's work force. Most of the increase will result from the growing need for newspaper delivery boys to service the rapidly expanding suburban areas. The proportions of the remaining white-collar occupations are not expected to change significantly during the 1960-75 period.

Chemical and Allied Products[36]

Current Employment

Nearly 960,000 wage and salary workers were employed in the chemicals and allied products major industry group in 1966. (See table 15.) More than half of total employment was concentrated in two industry groups–industrial chemicals, which accounted for nearly one-third of total employment; and plastics and synthetic fibers, (except glass), which represented more than one-fifth. Large numbers of workers also were employed by drug manufactures (13 percent), and by producers of soap, cleaners, and toilet goods (12 percent). The remaining workers were in establishments producing paints, varnishes, and allied products (7 percent); agricultural chemicals (6 percent); and other chemical product (10 percent).

Production workers accounted for 60 percent of total employment in this major industry group in 1966, compared to 74 percent in all nondurable manufacturing. The proportion of production workers among the industry groups constituting the major industry group ranged from 53 percent in the drugs industry to 66 percent in plastics and synthetics.

Women workers accounted for 19 percent of total employment in chemicals and allied products establishments in 1966, substantially lower than the 38 percent for all nondurable manufacturing. Among the individual industry groups, the proportion of women workers ranged from 9 percent in establishments producing agricultural chemicals to 39 percent in firms producing drugs. The relatively high ratio of women workers in the drugs industry reflected the large number of packaging and assembling occupations in establishments producing pharmaceutical preparations.

Employment Trends and Outlook

Employment in establishments manufacturing chemicals and allied products increased from 649,000 in 1947 to 958,000 in 1966, or about 48 percent. This increase was twice as rapid as the rate of growth in all manufacturing employment. During the same period, the chemicals production index rose 318 percent, more than 2½ times the growth rate of all manufacturing production.

The demand for chemicals and allied products has been stimulated, particularly in recent years, by the

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[36] SIC 18. This major group includes establishments producing basic chemicals, and establishments manufacturing products by predominantly chemical processes. Establishments classified in this major group manufacture three general classes of products: (1) Basic chemicals such as acids, alkalies, salts, and organic chemicals; (2) chemical products to be used in further manufacture such as synthetic fibers, plastics materials, dry colors, and pigments; (3) finished chemical products to be used for ultimate consumption such as drugs, cosmetics, and soaps; or to be used as materials or supplies in other industries such as paints, fertilizers, and explosives.

Table 15. Distribution of Wage and Salary Workers in the Chemicals and Allied Products Major Industry Group, by Industry, 1966

(In thousands)

SIC Code	Industry	Wage and salary workers		Production workers as percent of employment, by industry	Women workers as percent of employment, by industry
		Number	Percent distribution		
28	Chemicals and allied products	957.9	100.0	59.7	19.3
281	Industrial chemicals	301.5	31.5	56.6	10.2
2812	Alkalies and chlorine	25.2	2.6	69.4	7.9
2813-6	Industrial gases, cyclic crude dyes, and pigments	[1]62.1	[2]6.6	(3)	(3)
2818	Industrial organic chemicals, not elsewhere classified	118.9	12.4	45.4	12.9
2819	Industrial inorganic chemicals, not elsewhere classified	94.5	9.9	60.8	8.8
282	Plastics materials and synthetics	205.4	21.4	66.4	16.3
2821	Plastics materials and resins	88.4	9.2	62.8	9.4
2822	Synthetic rubber	[1]13.8	[2]1.5	(3)	(3)
2823, 4	Synthetic fibers	102.9	10.7	69.7	23.3
283	Drugs	126.9	13.2	52.6	38.8
2831, 3	Other drugs and medicines	[1]31.2	[2]3.3	(3)	(3)
2834	Pharmaceutical preparations	94.7	9.9	50.5	42.0
284	Soap, cleaners, and toilet goods	109.7	11.5	61.1	36.6
2841	Soap and detergents	38.0	4.0	67.9	21.8
2842, 3	Other cleaning polishing, and sanitation preparation	[1]29.6	[2]3.2	(3)	(3)
2844	Toilet preparation	41.2	4.3	60.7	55.8
285	Paints, varnishes, and allied products	67.6	7.1	55.8	15.5
287	Agricultural chemicals	54.7	5.7	65.0	8.8
2871, 2	Fertilizers complete and mixing only	40.7	4.2	69.5	7.1
2879	Agricultural chemicals except fertilizer	[1]14.1	[2]1.5	(3)	(3)
286, 9	Other chemical products	92.1	9.6	63.7	17.4
286	Gum and chemicals	[1] 6.9	[2]0.7	(3)	(3)
289	Miscellaneous chemical products	[1]80.7	[2]8.6	(3)	(3)
2892	Explosives	[1]23.9	[2]2.5	(3)	(3)
2891, 3, 5, 9	Other chemical products, not elsewhere classified	[1]56.8	[2]6.0	(3)	(3)

[1] Benchmark data for March 1966.

[2] Based on March 1966, total employment in the major industry group.

[3] Data are not available.

Note: Individual items may not add to totals because of the inclusion of benchmark data and/or rounding.

tremendous increase in research and development activity, which resulted in many new products such as petrochemicals. In 1963, research and development expenditures by the chemicals industry totaled $1.25 billion–10 percent of all such funds expended by all industries, and nearly double the amount spent by the chemicals major industry group in 1956. It is estimated that more than 90 percent of the drugs and pharmaceuticals in use today were not in commercial production in 1939.

Although employment in each of the chemical industry groups rose between 1958 and 1966,[37] the rates of growth differed widely. Employment increased most rapidly (44 percent) in establishments producing plastics and synthetics. Employment grew moderately in establishments producing soaps, cleaning preparations, and toilet goods because of the greater number of consumers, spendable income, and the variety of products produced. Moderate employment gains in plants producing agricultural chemicals reflected the growing role of fertilizers, pesticides, vitamins, antibiotics (for farm animals), and other chemicals in modern farming techniques. In contrast, employment rose only slightly in the large industrial chemicals industry group, as continuous flow process technology significantly increased output per worker.

Production workers decreased as a proportion of total employment in this major industry group, from 75 percent in 1947 to 60 percent in 1966. Among most of the individual industry groups, the proportion of production workers to total employment declined at about the same rate between 1958 and 1966. The exception was in establishments producing plastics materials and synthetics; and soap, cleaners, and toilet goods; the proportions remained about the same.

Manpower requirements in this major industry group are expected to increase about 15 percent between 1966 and 1975, rising from 958,000 to more than 1.1 million. (See volume IV, appendix B.) Employment will be spurred by substantial increases in the demand for chemicals and allied products, resulting mainly from a rising population and higher personal and corporate income. Rising levels of expenditures for research and development should continue, resulting in new products and markets for chemicals and allied products. However, increasing use of laborsaving technological devices are expected to limit employment growth, particularly in establishments producing industrial chemicals, petrochemicals, and plastics and other synthetics.

Employment is expected to increase very rapidly in several chemical industry groups. For example, demand for drugs is expected to accelerate sharply because of higher pension and social security payments and improved living and health standards, combined with increased numbers of persons age 55 and over. Also, the industry's extensive drug research and development program will probably yield a broad range of new products that will stimulate increased demand. Demand for plastics also is expected to increase, particularly for new and improved plastics for use in building construction, automobiles, housewares, and packaging. In addition, demand for industrial chemicals, such as acids, salts, and other basic raw materials, will continue to advance with overall industrial activity.

Occupation Structure

White-collar workers made up about 45 percent of total employment[38] in the chemicals and allied products major industry group in 1960, (see volume IV, appendix G) substantially higher than the average for all nondurable manufacturing. Professional, technical, and kindred workers accounted for more than 1 out of 6 workers–a proportion about three times larger than the average for nondurable manufacturing. Nearly 15 percent of all workers were scientists, engineers, and technicians, reflecting the emphasis on research and development activities and the sophisticated nature of the production processes in some plants. Operatives accounted for about 3 out of 10 workers–nearly 90 percent of these workers were in the miscellaneous operative group, which included occupations such as acid loader, spool winder, silk hanger, pill maker, tablet coater, cosmetic maker, and brine plant operator. Another large occupational group was craftsmen who represented about 15 percent of employment. Large numbers of mechanics, repairmen, and foremen were employed.

The occupational structure of the chemicals and allied products major industry group differed considerably among the four industry segments. White-collar workers in the drug industry segment accounted for more than 2 out of 3 workers, and nearly half of these were professional, technical, and kindred workers. Many scientists (particularly chemists and biological scientists) and technicians were needed in the drug industry for the extensive research and development programs. Sales workers also accounted for a substantial proportion of employment in the drug industry, primarily because of the practice of introducing each new drug individually to doctors, hospitals, and drug outlets. On the other hand, white-collar workers in the synthetic fibers industry segment accounted for only about 1 out of 5 workers, and the proportion of professional, technical, and kindred workers was less than one-half of its counterpart in the drug industry segment. Moreover, sales workers in the synthetic fibers industry, where there is less competi-

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[37] BLS employment (payroll) data for all of the individual industry groups are not available for the years prior to 1958.

[38] Including self-employed and unpaid family workers, as well as wage and salary workers.

tion, accounted for less than one percent of total employment. Managers, officials, and proprietors accounted for about 12 percent of employment in the paint industry segment, but only 2 percent in the synthetic fibers segment. The decentralized nature of the paint industry results in a high proportion of managers.

The occupational structure of the chemicals and allied products major industry group is expected to change moderately by 1975. By far, the most significant change in the occupational structure will be a nearly 50-percent increase in the proportion of professional, technical, and kindred workers. This shift–affecting all industry segments–will result from the increasing requirements for technicians and engineers to operate the expanding research and development programs, and to design and improve increasingly sophisticated production processes. Managers, officials, and proprietors, and clerical workers ratios, however, are expected to decline because of the growing use of electronic data processing equipment and the trend toward the centralization of many managerial and clerical functions. Although sales workers are expected to decline slightly in the major industry group as a whole, they will increase in the consumer-oriented drug and paint industries, where competition will continue to be strong.

The proportion of craftsmen, foremen and kindred workers is expected to rise by 1975. The increasing use of laborsaving equipment will require more skilled craftsmen, both for supervision of production processes (e.g., foremen) and for maintenance (e.g., mechanics and repairmen). However, technological advances in the use of electronic computers to plan maintenance and to design plants, and the widespread use of new, corrosion resistant materials will help limit the increase in the proportion of craftsmen. The proportion of operatives is expected to remain relatively constant in the overall industry. Within the industry sectors, however, the proportion of operatives will decline as additional mechanization decreases the need for certain processing occupations. The introduction of automatic conveyors and other types of materials handling equipment is expected to reduce substantially the proportion of laborers in this industry. For example, products will be increasingly transported by mechanical and pneumatic conveyor systems; automatic palletizing machines will eliminate hand-stacking of cartons; and computers will increasingly be used to control and expedite warehousing and shipping activities. The expanding use of instrumentation and electronic computers to assist in the production processes in all segments of the major industry group, however, also will limit the rise in the ratio of operatives.

Petroleum Refining and Related Industries[39]

Current Employment

Approximately 186,000 wage and salary workers were employed in the petroleum refining and related industries major industry group in 1966. (See table 16.) About 8 out of 10 workers were employed in the petroleum refining industry group. The remaining workers were employed in establishments producing paving and roofing materials and miscellaneous products of petroleum and coal.

Production workers accounted for 62 percent of total employment in this major industry group in 1966, compared to 74 percent in manufacturing as a whole. Within the major industry group, the proportion of production workers was 60 percent in the petroleum refining industry and 71 percent in the other petroleum and coal products industry.

In 1966, women workers accounted for 9 percent of total employment in petroleum refining and related industries major industry group, substantially lower than the 27 percent in all manufacturing. Both industry groups within the major group had roughly the same proportion of women workers.

Employment Trends and Outlook

Between 1947 and 1966, employment in the petroleum refining and related industry group declined from 221,000 to 186,000, a decrease of 16 percent. Between 1947 and 1953, employment increased to 241,000, but since 1953, it has steadily declined to 186,000, whereas employment in manufacturing has increased. Production during the 1947-66 period has doubled in this major

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[39] SIC 29. This major group includes establishments primarily engaged in petroleum refining, manufacturing, paving and roofing materials, and compounding lubricating oils and grease from purchased materials.

Table 16. Distribution of Wage and Salary Workers in the Petroleum Refining and Related Industries Major Industry Group, by Industry, 1966

(In thousands)

Sic Code	Industry	Wage and salary workers: Number	Wage and salary workers: Percent distribution	Production workers as percent of employment, by industry	Women workers as percent of employment, by industry
29	Petroleum refining and related industries	186.0	100.0	62.3	9.0
291	Petroleum refining	149.6	80.4	60.2	8.6
295, 9	Other petroleum and coal products	36.4	19.6	70.6	10.7

Note: Individual items may not add to totals because of rounding.

industry division, a somewhat slower pace than the average for all manufacturing.

Between 1958 and 1966,[40] employment changes between the two broad sectors of this major industry group differed widely. Employment in petroleum refineries decreased significantly, although output of petroleum refining products increased as demand rose for fuel, lubricants, and raw materials for the fast growing petrochemical industry. Increased application of laborsaving technology, such as the continuous flow process, expanded faster than the increase in demand for the products of this industry group. Employment in establishments manufacturing paving and roofing materials and miscellaneous products of petroleum and coal remained relatively stable between 1958 and 1966.

Production workers decreased as a proportion of total employment in this major industry group, from 77 percent in 1947 to 62 percent in 1966. The rate of declined during the 1958-66 period was slower in establishments producing paving and roofing materials and miscellaneous products of petroleum and coal than in the petroleum refining industry group. The decreasing production worker ratio resulted from the increasing automation of production processes.

Manpower requirements in petroleum refining and related industries are expected to decline by 14 percent between 1966 and 1975, from 186,000 to 160,000, despite substantial increases in the production of petroleum products. (See volume IV, appendix B.) Employment in this major industry group is expected to decline at a slower rate through the mid-1970's than that experienced between 1953 and 1966. The pace of introducing new technology will slow somewhat, since automatic systems are now widely used throughout the refining industry. Future technological advances are expected to improve upon existing processes and result in fewer, but larger, plants that are highly mechanized and employ relatively few workers. Anticipated increases in contract-maintenance services also will reduce employment requirements during the coming decade.

Occupational Structure

White-collar workers accounted for more than two-fifths of total employment[41] in the petroleum refining and related industries major industry group in 1960—about one-third higher than in nondurable manufacturing as a whole. (See volume IV, appendix G.) The proportion of professional and technical workers (16 percent) was particularly high, attributable to the advanced state of mechanization and the emphasis placed on research and development activities in refineries. Operatives, by contrast, represented a smaller proportion of employment (26 percent) in petroleum refining nondurable manufacturing. Many of the processes in refineries are automatically monitored and controlled, thus reducing the need for these workers. About one-fifth of the workers were craftsmen; foremen constituted about one-quarter of this occupational group. The capital-intensive nature of the modern refinery requires many first-line plant supervisors. Plumbers and pipefitters, who install, repair, and maintain the networks of pipes associated with continuous flow technology, also accounted for a significant proportion of employment in the craftsmen occupational group. In spite of the advanced state of technology in 1960, about 8 percent of the workers were laborers. Many of these workers, however, were employed in the other petroleum and coal products industry group, where "batch type" production processes require large numbers of unskilled materials handlers.

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[40] BLS employment (payroll) data for all industry groups are not available for years prior to 1958.

[41] Including self-employed and unpaid family workers, as well as wage and salary workers.

By 1975, the most significant impact of technology in this major industry group will occur in refineries, where more than 4 out of 5 workers are employed. Larger and more highly automated plants will continue to replace less efficient plants. Substantial economies of scale are achieved by increasing the size of refineries. Instrumentation and computer control—which are highly developed in this major industry group—will increasingly be applied to production processes in refineries. Most computers now in use receive data, perform calculation, and turn out operating instructions, but operators still make the indicated adjustment. By 1975, however, a few installations may feature fully-automated closed-loop operations. Computers also will be used more extensively in offices to perform routine bookkeeping and clerical tasks. Computer use as a research tool also will become more widespread.

Occupational structure in the petroleum and related industries major industry group will be mainly affected by advances in technology which will continue to reduce the need for operatives, laborers, and—to an extent—craftsmen. The decline in the proportion of operatives and laborers will reflect the trend to more efficient, large refineries and increasingly sophisticated automatic control equipment. Advances in materials quality also will reduce the need for laborers as fewer turnarounds—major overhauls—are required. The proportion of professional and technical workers will rise by about one-third, although absolute employment in this category will show little change. The proportion of technicians, in particular, will increase to handle the operation and maintenance requirements of advanced refinery processes.

The ratio of skilled workers is expected to decline slightly. An increasing amount of maintenance work is being contracted out to specialized firms. This practice will adversely affect the employment in maintenance occupations, causing some to decline and limiting growth in others.

Rubber and Miscellaneous Plastics Products[42]

Current Employment

About 510,000 wage and salary workers were employed in the rubber and miscellaneous plastics products major industry group in 1966. (See table 17.) More than 20 percent worked in establishments manufacturing tires and innertubes; 35 percent were in establishments producing other rubber products (footwear, reclaimed rubber, and fabricated rubber products, not elsewhere classified, and the remainder were employed in establishments producing miscellaneous plastics products.

Production workers accounted for nearly 78 percent of total employment in this major industry group in 1966, compared with 74 percent for all manufacturing. The proportions of production workers ranged from about 71 percent in the tire and tube industry to over 80 percent in the miscellaneous plastics products industry.

Women workers accounted for 31 percent of total employment in the rubber and miscellaneous plastics products major industry group in 1966, slightly higher than the 27 percent for all manufacturing. Among the individual industry groups, the proportion of women workers differed widely ranging from 12 percent of the work force in establishments producing tires and innertubes to 37 percent in establishments manufacturing miscellaneous plastics products.

Employment Trends and Outlook

Employment in rubber and miscellaneous plastics products major industry group increased over twice as rapidly as employment in total manufacturing between 1947 and 1966. The numbers of workers employed in this industry rose from 323,000 in 1947 to about 510,000 in 1966— an increase of almost three-fifths. During the same period, production rose by 206 percent, more than 1½ times as fast as the increase in total manufacturing production. Most of the gain in production was recorded between 1954 and 1966.

Employment growth has varied greatly among the industries in this major group. During the 1958-66 period[43] employment rose very rapidly in the miscellaneous plastics products industry, more than doubling

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[42] SIC 30. This major group includes the manufacture of rubber products from natural, synthetic or reclaimed rubber; the manufacture of or rebuilding of retreaded tires; and the molding of primary plastics for the trade and the manufacture of miscellaneous finished plastics products.

[43] BLS employment (payroll) data for the other rubber products industry are not available for years prior to 1958.

Table 17. Percent Distribution of Wage and Salary Workers, in the Rubber and Miscellaneous Plastics Products Major Industry Group, by Industry, 1966

(In thousands)

SIC Code	Industry	Wage and salary workers		Production workers as percent of employment, by industry	Women workers as percent of employment, by industry
		Number	Percent distribution		
30	Rubber and miscellaneous plastics products	509.8	100.0	77.9	30.6
301	Tires and innertubes	107.2	21.0	70.9	11.9
302, 3, 6	Other rubber products	178.7	35.1	79.3	34.1
302	Rubber footwear	[1]26.2	[2]5.3	(3)	(3)
303, 6	Reclaimed rubber and other rubber products, not elsewhere classified	[1]149.7	[2]30.2	(3)	(3)
307	Miscellaneous plastics products	223.9	43.9	80.2	36.7

[1] Benchmark data for March 1966.

[2] Based on March 1966, total employment as the major industry group.

[3] Data are not available.

Note: Individual items may not add to totals because of the inclusion of benchmark data and/or rounding.

from 101,000 in 1958 to 224,000 in 1966. Employment grew substantially in the other rubber products industry (29 percent), but increased only slightly in the tire and innertube industry (3 percent).

The varied employment growth rates are the result of two significant factors–increased demand for the many and diverse rubber and plastics products, and greater use of laborsaving technological devices in the tire industry. Demand for tires increased steadily but the growth in use of laborsaving innovations more than offset rising demand.

Production workers decreased as a proportion of total employment in this major industry group, from 81 percent in 1947 to 78 percent in 1966. However, during the 1958-66 period, the relative importance of production workers showed little change.

Manpower requirements in the rubber and miscellaneous plastics products major industry group are expected to increase by over 15 percent between 1966 and 1975, rising to about 580,000. Employment growth will occur primarily from the rising demand for products manufactured in this major industry group, particularly products of the miscellaneous plastics industry. The continuing increase in the substitution of plastics for wood, glass, and metal, together with new product development, will foster considerable employment growth.

Employment trends for the three broad sectors of this major industry group are expected to differ. (See volume IV, appendix B.) Employment in the tires and innertubes industry is expected to remain relatively stable to 1975. The demand for tires and innertubes will continue to increase, but growing use of automatic and semi-automatic machines and electronic control equipment in processes, such as tire building, are expected to limit the need for additional employment.

Employment levels in establishments producing rubber products other than tires and innertubes are expected to rise because of the increasing demand for such items as footwear, drug and medical sundries, wire and cable coating, and foam rubber. Relatively small production runs makes the introduction of laborsaving technological innovations more difficult in this industry, although mechanized production systems are being used in some areas, such as drug sundries and some facets of footwear production.

Employment in establishments producing miscellaneous plastics products is expected to increase rapidly between 1966 and 1975. Employment growth will reflect an increasing use of the products of this industry group in construction, appliances, packaging, and general industrial and consumer products. Government sponsored activities, such as aerospace, also will contribute to the additional demand for plastics products.

Occupational Structure

Nearly three-fourths of the workers in this industry are concentrated in the blue-collar occupational group. In 1960, operative and kindred workers alone accounted for over one-half of the work force. (See volume IV, appendix G.) Included in the operative group are the semi-skilled operators and tenders needed to operate the wide variety of production process machines used throughout the rubber and plastics products industry. Craftsmen, foremen and kindred workers, mainly foremen and maintenance workers, accounted for over one-eigth of the industry's work force in 1960. Laborers, the smallest blue-collar occupational group, accounted for less than 6 percent. Clerical workers, managers, officials, and proprietors were the largest white-collar occupational groups, representing about three-fourths of all white-collar workers in 1960. Clerical employees accounted for about 13 percent of the work force, about twice the proportion employed as managers, officials, and proprietors. Professional, technical and kindred workers constituted less than 5 percent of the work force; scientists and technicians made up the majority of these highly trained workers.

During the coming decade, the impact of technological innovations on manpower requirements will vary considerably among the individual sectors of the industry. In the rubber products industry, relatively few changes of occupational significant are expected. The rubber tires and tubes industries are already highly mechanized. The wide product diversity and short production runs which characterize much of the remainder of the rubber industry will continue to restrict the prospects for widespread automation. Some changes, such as a decrease in the need for unskilled laborers, are expected to result from general plant modernization and the increasing use of conveyors and other power equipment for material movement.

In the plastic products industry, the expanding mechanization of the production process will reduce the need for semiskilled workers. The small establishment size, which characterizes this industry, has hampered mechanization in the past. As average plant size increases in the years ahead, the larger firms will be able to invest more heavily in new plant and equipment. As mechanization grows, the need for unskilled workers will decline. Conversely, the demand for skilled mechanics and repairmen needed to maintain the new equipment will increase.

An increase in the proportion of professional workers is expected. More scientists, engineers, and technicians will be needed as a greater emphasis is placed on research, particularly research directed towards the development of new products.

Little change is expected in the proportions of other major white collar occupations. The increasing use of computers and other office equipment will tend to lower the requirements for certain clerical occupations. However, the growth in establishment size, where clerical workers make up a large share of the work force, will largely offset the affects of this new equipment.

Leather and Leather Products[44]

Current Employment

About 364,000 wage and salary workers were employed in the leather and leather products major industry group in 1966. (See table 18) Two-thirds of the workers were employed in establishments producing footwear (except rubber). About 1 out of 10 workers were engaged in the manufacture of handbags and other personal leather goods, and nearly an equal number were employed in leather tanning and finishing establishments. The remaining workers were in establishments manufacturing "other" leather products, which include industrial leather belting and packing, boot and shoe cut stock and findings, leather gloves and mittens, luggage, and other leather goods.

Production workers accounted for almost 90 percent of employment in this major industry group in 1966. This was one of the highest proportions of production workers in any industry group in manufacturing, and compares with 74 percent for manufacturing as a whole. The individual industry groups within the leather and leather products major industry group had about the same proportions of production workers. Women workers accounted for over half of total employment in this major industry group, about double the proportion in all manufacturing. Among the individual industry

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[44] SIC 31. This major group includes establishments engaged in tanning, currying, and finishing hides and skins; and establishments manufacturing finished leather and artificial leather products and some similar products made of other materials. Leather converters also are included.

Table 18. Distribution of Wage and Salary Workers in the Leather and Leather Products Major Industry Group, by Industry, 1966

(In thousands)

SIC Code	Industry	Wage and salary workers		Production workers as percent of employment, by industry	Women workers as percent of employment, by industry
		Number	Percent distribution		
31	Leather and leather products	363.5	100.0	87.6	55.0
311	Leather tanning and finishing	31.7	8.7	87.1	12.0
313	Boot and shoe cut stock	1/13.6	2/3.7	(3)	(3)
314	Footwear, except rubber	240.6	66.2	88.7	60.2
316	Luggage	1/20.4	2/5.6	(3)	(3)
317	Handbags and personal leather goods	38.6	10.6	87.0	67.9
312, 5, 9	Other leather products, not elsewhere classified	1/17.6	2/4.8	(3)	(3)

1/ Benchmark data for March 1966.
2/ Based on March 1966, total employment in the major industry group.
3/ Data are not available.

groups, the proportion of women workers ranged from 12 percent in leather tanning and finishing plants to 68 percent in establishments manufacturing handbags and other personal leather goods.

Employment Trends and Outlook

Employment in establishments manufacturing leather and leather products declined from 412,000 to 364,000 between 1947 and 1966, or by about 12 percent. Production rose by 13 percent, about one-tenth as rapidly as the increase for total manufacturing production.

Between 1947-1966, the sharpest employment decline within this major industry group was experienced in the leather tanning and finishing industry, where employment fell by over two-fifth; manufacturers of shoes and other leather products increasingly substituted man-made materials for leather. For example, by means of a vacuum forming process, a single piece of specially developed synthetic material constitutes the bottom and most of the upper parts of a recently introduced line of women's casual shoes. The number of workers in the footwear (except rubber) industry declined by about 8 percent in the same 19 year period, primarily because of increases in output per worker and the growing volume of imported shoes. Manufacturers were able to reduce labor requirements by producing shoes of simpler construction, by using man-made materials, and by using more automatic equipment. Between 1958 and 1966,[45] combined employment in the other sectors of the leather and leather products major industry group was relatively stable.

Production workers in this major industry group decreased slightly as a proportion of total employment, from 91 percent in 1947 to 88 percent in 1966. The rate of decline was similar in each individual industry group.

Manpower requirements in leather and leather products manufacturing in 1975 are expected to be slightly below the level of 1966. (See volume IV, appendix B.) Domestic production of footwear (except rubber) is expected to increase moderately by 1975. Some of the increased demand for footwear, generated by a growing population, is expected to be satisfied by imports. Increasing output per worker is expected to roughly offset the moderate rise in output. More use of man-made materials as substitutes for leather, the development of more uniform leathers, and improved production machinery are the primary factors that are expected to increase output per workers.

Employment in the footwear (except rubber) and "all other leather products" industry groups are expected to remain relatively stable. In leather tanning and finishing establishments, employment will decrease as a result of the growing mechanization in the processing of hides. Although the increasing use of man-made materials may make further inroads, the industry is finding ways to make better, more uniform leather products, and the full effect of man-made materials on employment will depend on the extent that this development succeeds.

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[45] BLS employment (payroll) data are not available for 6 of the 8 leather and leather products industry groups for the years prior to 1958.

Occupational Structure

Blue-collar workers accounted for more than 8 out of 10 workers[46] in this major industry group in 1960, a ratio substantially higher than that for all nondurable manufacturing. (See volume IV, appendix G) This was due in large measure to the high proportion of operatives in leather and leather products manufacturing. Production operations in this industry are only partially mechanized, and many semiskilled workers, such as stichers, lasting machine operators, vampers, fitters, and trimmers, are needed.

In 1960, the occupational structure differed somewhat among the three sectors of the leather products major industry group. The ratio of operatives and kindred workers was highest in the manufacture of footwear (except rubber). Production of footwear is a complicated process involving the assembly of many parts through a long series of hand and machine operations, many of which require semiskilled workers. The leather tanning and finishing industry segment had by far the largest proportion of laborers, reflecting requirements for moving and handling large quantities of hides and other materials. This industry group also had the largest proportion of craftsmen, many of these workers were foremen needed to direct machine operators and maintenance personnel. Also, many were mechanics and repairmen needed to maintain and repair tanning and finishing equipment.

Among the three industry sectors, the proportions of sales workers and managers, officials, and proprietors were somewhat higher in establishments manufacturing "other" leather products. In part, this was because companies in this segment are relatively small and highly competitive.

A number of significant developments are occurring in the leather industry that will substantially affect methods of production during the next 10 years. Such technological developments are expected to substantially alter the industry's occupational structure by 1975. For example, the proportion of operatives will decline somewhat because of the greater use of more efficient production equipment, including injection molding and vulcanizing equipment; thermalasting machinery; and geometric lasting equipment. The use of more uniform leather and leather substitutes in shoe manufacturing is expected to affect employment requirements adversely for cloth lining cutters, upper cutters, and workers engaged in mulling, treeing, splitting, and skinning. Operatives, however, will still represent the largest proportion of total employment in 1975. On the other hand, requirements for skilled mechanics and maintenance workers will increase. Also, requirements for foremen, needed to supervise more complex operations, should rise. Concentrated in the leather tanning and finishing sector of the industry, laborers should be adversely affected by the greater application of more efficient materials handling techniques such as conveyor systems, improved palletizing methods, and, in some cases, computer-controlled warehouse systems.

Increases in professional, technical, and kindred workers are expected mainly because of increasing requirements for professional workers in research and development activities. Clerical requirements should rise substantially due to trends towards larger plants, which need greater proportions of clerical workers to assist in such activities as inventory and cost control, centralized billing and accounting, and marketing research operations.

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[46] Including self-employed and unpaid family workers, as well as wage and salary workers.

Stone, Clay, and Glass Products[47]

Current Employment

About 645,000 wage and salary workers were employed in the stone, clay, and glass products major industry group in 1966. (See table 19.) More than half of the workers were employed in establishments manufacturing clay products, including cement, concrete, gypsum, plaster, and pottery. Slightly more than one-fourth of all the workers were in establishments making glass products, including flat glass, glass containers, and other blown and pressed glass products. The remaining establishments, those producing stone and other nonmetallic mineral products, employed about one-fifth of the workers.

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[47] SIC 32. This major group includes establishments engaged in manufacturing flat glass and other glass products, cement, structural clay products, pottery, concrete and gypsum products, cut stone products, abrasives and asbestos products, etc., from materials taken principally from the earth in the form of stone, clay, and sand.

Table 19. Distribution of Wage and Salary Workers in the Stone, Clay, and Glass Major Industry Group, by Industry, 1966

(In thousands)

SIC Code	Industry	Wage and salary workers		Production workers as percent of employment, by industry	Women workers as percent of employment, by industry
		Number	Percent distribution		
32	Stone, clay, and glass products	644.6	100.0	80.3	15.7
321	Flat glass	32.7	5.1	79.2	4.9
322	Glass and glassware, pressed or blown	122.6	19.0	87.3	32.0
3221	Glass containers	69.4	10.8	88.3	34.3
3229	Pressed and blown glassware, not elsewhere classified	53.2	8.3	85.7	28.9
323	Glass products, made of purchased glass	1/ 23.0	2/ 3.7	(3)	(3)
324	Cement, hydraulic	38.0	5.9	76.8	3.7
325	Structural clay products	70.3	10.9	84.5	11.4
3251	Brick and structural clay tile	31.0	4.8	88.4	3.2
3255	Clay refractories	1/ 14.9	2/ 2.4	(3)	(3)
3253, 9	Other structural clay products	1/ 24.0	2/ 3.8	(3)	(3)
326	Pottery and related products	43.3	6.7	85.0	32.3
327	Concrete, gypsum, and plaster products	178.9	27.8	77.0	5.5
328, 9	Other stone and nonmetallic mineral products	135.7	21.1	75.5	15.2
328	Cut stone and stone products	1/ 17.2	2/ 2.7	(3)	(3)
329	Abrasive, asbestos, and miscellaneous nonmetallic mineral products	1/116.4	2/18.5	(3)	(3)
3291	Abrasive products	27.2	4.2	68.4	21.7
3292	Asbestos products	1/ 25.7	2/ 4.1	(3)	(3)
3293, 5-7, 9	Miscellaneous nonmetallic mineral products	1/ 64.4	2/10.2	(3)	(3)

1/ Benchmark data for March 1966.
2/ Based on March 1966, total employment in the major industry group.
3/ Data are not available.

Note: Individual items may not add to totals because of the inclusion of benchmark data and/or rounding.

Production workers accounted for 80 percent of total employment in the major industry group in 1966, compared with 74 percent for all manufacturing. The proportion of production workers among the individual industry groups varied little from the average of the major industry group.

Women workers accounted for 16 percent of total employment in this major industry group, substantially lower than the 27 percent for all manufacturing. Among the individual industries that make up this group, the proportion of women workers ranged from 4 percent in establishments manufacturing hydraulic cement to 32 percent in establishments manufacturing pottery and related products; and glass and glassware, pressed or blown.

Employment Trends and Outlook

Employment in establishments manufacturing stone, clay, and glass products increased from 537,000 to about 645,000 between 1947 and 1966, or approximately 20 percent. This was slightly lower than the rate of increase for all manufacturing. During the same period, production rose by 110 percent, about four-fifths as fast as the growth of total manufacturing production.

Between 1958 and 1966,[48] employment trends among the three broad sectors of the major industry group differed. Although the sector producing glass products is highly mechanized, employment increased most rapidly in this group (24 percent) to satisfy the growing demand for its products, particularly glass containers and flat (sheet) glass. During the 1958-66 period, employment declined slightly in the manufacture of structural clay products because the growth of demand was slower than the rapid utilization of labor-saving equipment. Employment of workers producing cut stone and stone products increased by 11 percent, reflecting the demand by industrial users for such materials as abrasives, asbestos, and rockwool insulation.

Production workers decreased as a proportion of total employment in this major industry group, from 88 percent in 1947 to 80 percent in 1966. During the 1958-66 period, production workers as a proportion of employment increased in one industry group–other stone mineral products–but decreased in all other industries within the major industry group. The decreasing production worker ratios in the majority of the industry groups resulted from the expanding mechanization of production operations.

Employment requirements in this major industry group are expected to rise only slightly between 1966 and 1975, to about 655,000. Output is expected to be stimulated by increases in population, new family formations, rising levels of highway and building construction, and expanding manufacturing activity, particularly for motor vehicles. However, employment growth is expected to be limited because of the introduction and greater use of laborsaving equipment and improved production techniques, such as new coating materials that reduce glass breakage, semiautomatic electronic devices that inspect bottles and other glass containers, and prestressed concrete and concrete containing additives to control shrinkage and to provide greater resilience.

Employment trends for the individual industries within the three broad sectors of this major industry group are expected to differ widely. (See volume IV, appendix B.) For example, worker requirements in the industry producing glass containers are expected to increase because of a substantial increase in demand. Employment requirements in these establishments are not expected to be significantly affected by mechanization and other technological innovations because the industry is already highly mechanized. In contrast, employment in establishments making flat glass products is expected to decline, despite rising demand, primarily because of the introduction of the "float" process. Labor requirements in establishments producing other pressed or blown glass products are expected to remain relatively unchanged. Although the substitution of plastic materials for these glass products is anticipated, many glass manufacturers are, or can be, equipped to produce the plastic substitutes.

Employment trends also are expected to vary among industries producing clay products. For example, employment requirements of establishments producing hydraulic cement and concrete block are expected to remain relatively stable during the next decade, despite increasing demand for their products, because the use of automatic controls in production processes are expected to account for greater output per worker. On the other hand, employment requirements in other clay producing industries (those producing gypsum, plaster, lime, and other concrete products) are expected to increase because of growing demand. Also, accelerating home construction activity, anticipated as the result of new family formations, will stimulate the demand for such products as plaster, plasterboard, brick, clay pipe, and ceramic title.

Employment requirements in the industries producing cut stone and stone products are expected to remain relatively stable through the mid-1970's as increasing demand for construction related products-insulation, asbestos, etc.–is roughly offset by a drop in demand for longer lasting abrasive products.

Occupational Structure

In 1960, blue-collar workers made up nearly three-fourths of the total employment in the Stone, Clay, and Glass products industry. Operative and kindred workers alone accounted for about 45 percent of the work force, the largest single occupational group. (See volume IV, appendix G.) The manufacturing of cement, concrete, glass, tile, and bricks is, for the most part, highly mechanized and requires large numbers of semiskilled workers to operate and monitor the processing machinery. Truck drivers account for an important share of the operative occupational group. In the cement and concrete manufacturing sector, drivers accounted for an especially high proportion of the work force, representing over 1 out of 6 workers in 1960. The remaining blue-collar workers were about equally divided between the craftsmen, foremen and kindred workers group, and unskilled laborers. Each of these occupational groups made up about 15 percent of the work force. Over one-half of the craftsmen were employed either as foremen or as mechanics and repairmen.

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[48] BLS employment (payroll) data for only three industry groups–hydraulic cement, structural clay products, and pottery and related products–are available for years prior to 1958.

Among the white-collar occupations, clerical workers accounted for the largest number of workers. In 1960, 1 out of 10 workers in the industry was employed in a clerical position. Managers, officials, and proprietors accounted for less than one-tenth of the work force. Relatively few workers were employed in professional or sales occupations.

Some changes in the industry's occupational structure are expected during the 1960-75 period. Within the operative group, the proportion of truck drivers is expected to increase. Additional drivers will be needed to transport the expanding production of the industry. Trucking also is supplying a growing share of the industry's transport needs. For example, in 1964, over two-thirds of the portland cement shipments were transported by truck. Partially offsetting the increase of truck drivers will be a decline in the proportion of semiskilled operatives engaged in production processing operations. Although production will increase substantially, the use of faster, more automatic equipment will slightly lower the need for semiskilled machine operators and tenders. The proportion of mechanics and repairmen is expected to increase, since the use of more complex machinery and control devices will raise the requirements for highly skilled maintenance workers. The proportion of laborers, on the other hand, will decrease sharply as conveyors, pneumatic loading, and other power equipment reduce the need for unskilled materials movement workers.

Among the white-collar occupations, the most significant change will occur in the proportion of professional, technical, and kindred workers. The increase in the proportion of these highly trained workers will result from the growing demand for engineers and technicians, particularly those engaged in research and product development activities.

Primary Metal Industries[49]

Current Employment

More than 1.3 million wage and salary workers were employed in the primary metal industries major industry group in 1966. (See table 20.) About two-thirds of employment was concentrated in the ferrous industry groups, including blast furnaces, steel works, and rolling and finishing mills, which employed almost half of the workers in ferrous metals; and iron and steel foundries, which employed another 18 percent. Over one-fourth were employed in nonferrous industries engaged in smelting and refining; rolling, drawing, and extruding; and foundry activities. The remaining workers (5 percent) were employed in establishments producing miscellaneous primary metal products, including both ferrous and nonferrous forgings.

Production workers accounted for 81 percent of employment in primary metals in 1966, compared with 74 percent in all manufacturing. The individual industry groups had about equal proportions of production workers, although in the nonferrous smelting and refining group and the nonferrous rolling, drawing, and extruding group, the proportions were slightly lower.

Women workers accounted for only about 6 percent of employment in the primary metal industries, much lower than the 27 percent in manufacturing as a whole. Among the individual industry groups, the proportion of women workers ranged from 4 percent in the blast furnaces and basic steel products industry to 13 percent in nonferrous rolling, drawing, and extruding mills.

Employment Trends and Outlook

Employment in the primary metal industries group in 1966 differed little from the 1947 level of 1.3 million workers. In contrast, total employment in all manufacturing increased by 23 percent from 1947 to 1966. During the same period, production in the primary metal industries rose by 52 percent, compared with a 139-percent increase in total manufacturing production.

Employment increased in both the ferrous and nonferrous segments of the primary metal industries between 1958 and 1966, although the rates of growth differed, primarily reflecting differences in the rates of

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[49] SIC 33. This major industry group includes establishments engaged in the smelting and refining of ferrous and nonferrous metals from ore, pig, or scrap; in the rolling, drawing, and alloying of ferrous and nonferrous metals; and in the manufacture of castings, forgings, and other basic products of ferrous nonferrous metals; and in the manufacture of nails, spikes, and insulated wire and cable. This group also includes the production of coke.

Table 20. Distribution of Wage and Salary Workers in the Primary Metal Industries Major Industry Group, by Industry, 1966

(In thousands)

SIC Code	Industry	Wage and salary workers		Production workers as percent of employment, by industry	Women workers as percent of employment, by industry
		Number	Percent distribution		
33	Primary metal industries	1,345.4	100.0	81.4	6.3
331	Blast furnace and basic steel products	651.3	48.4	81.4	4.1
3312	Blast furnaces, steel and rolling mills	571.3	42.5	81.8	3.5
3313, 5, 6	Steel finishing mills and electrometallurgical products	1/52.5	2/4.0	(3)	(3)
3317	Steel pipe and tubes	1/27.1	2/2.0	(3)	(3)
332	Iron and steel foundries	238.5	17.7	85.5	4.8
3321	Gray iron foundries	141.5	10.5	86.3	4.0
3322	Malleable iron foundries	27.7	2.1	84.8	4.3
3323	Steel foundries	69.3	5.2	84.0	6.8
333, 4	Nonferrous smelting and refining	78.1	5.8	77.2	4.0
333	Primary smelting and refining of nonferrous metals	1/60.7	2/4.6	(3)	(3)
3331	Primary smelting and refining of copper	1/16.0	2/1.2	(3)	(3)
3332	Primary smelting and refining of lead	1/ 3.4	2/0.3	(3)	(3)
3333	Primary smelting and refining of zinc	1/ 9.6	2/0.7	(3)	(3)
3334	Primary production of aluminum	1/23.6	2/1.8	(3)	(3)
3339	Primary smelting and refining of nonferrous metals, not elsewhere classified	1/ 8.2	2/0.6	(3)	(3)
334	Secondary smelting and refining of nonferrous metals	1/15.5	2/1.2	(3)	(3)
335	Nonferrous rolling, drawing, and extruding	215.0	16.0	77.5	13.3
3351	Copper rolling, drawing and extruding	48.4	3.6	77.5	7.9
3352	Aluminum rolling, drawing, and extruding	71.4	5.3	78.3	8.0
3356	Other nonferrous rolling, drawing and extruding	1/22.3	2/1.7	(3)	(3)
3357	Nonferrous wire drawing and insulating	71.9	5.3	78.4	22.5
336	Nonferrous foundries	90.5	6.7	84.3	11.4
3361	Aluminum castings	44.5	3.3	86.1	8.3
3362, 9	Other nonferrous castings	45.9	3.4	82.8	14.4
339	Miscellaneous primary metal products	72.1	5.4	80.9	6.4
3391	Iron and steel forgings	49.1	3.6	82.3	5.3
3392, 9	Primary metal industries, not elsewhere classified	1/22.6	2/1.7	(3)	(3)

1/ Benchmark data for March 1966.

2/ Based on March 1966, total employment in the major industry group.

3/ Data are not available.

Note: Individual items may not add to totals because of the inclusion of benchmark data and/or rounding.

increase in production and in the introduction of laborsaving technology. Employment in iron and steel industries increased by 24 percent while employment in the nonferrous industries rose by 27 percent. An expanding population and rising levels of disposable income were among factors stimulating demand for metal consumer durables, including automobiles and household appliances. Increasing demand for highways, commercial and industrial construction, and producers durable equipment, such as machinery, also contributed substantially to the rise in employment. However, laborsaving innovations, such as the basic oxygen furnace and continuous casting of aluminum, increased output per worker and limited employment growth.

Despite the substantial increase anticipated in output, manpower requirements in the primary metal industries in 1975 are expected to be relatively unchanged from 1966, even assuming a slight reduction in imports of steel. Production of metal consumer durables is expected to increase during the next decade in response to growth of the population and rising levels of disposable income. Output also is expected to be stimulated by an increased demand for housing, factories, office buildings, highways, and producers of durable equipment such as machinery.

Employment trends in the various ferrous and the nonferrous industry groups are expected to differ widely. (See volume IV, appendix B.) Manpower requirements in nonferrous foundries are expected to be greater because of a substantial increase in the demand for nonferrous (especially aluminum) castings. In contrast, little employment growth is expected in establishments producing and casting iron and steel. The growing use of electronic data processing and communications equipment is expected to result in increased efficiency in office operations, particularly in basic iron and steel establishments. Continuing increases in output per worker are expected to result from the extensive use of the basic oxygen furnace and the continuous casting process; greater use of oxygen in blast furnaces and open hearth furnaces; continued mechanization of materials handling operations; and greater use of instruments to control production, especially in rolling mills, in tin coating processes, and in heating and controlling furnaces. However, growing industrial requirements for improved grades of steel may somewhat slow the future growth of output per worker.

Manpower requirements in the remainder of the major industry group are expected to increase slightly between 1964 and 1975. Continued mechanization of materials handling is expected to be one of the major factors in limiting manpower requirements in these industries.

Occupational Structure

The production of metals requires the use of massive and complex furnaces, rolling mills, and other specialized metal processing and forming equipment. Tons of raw materials and semifinished and finished metal products are often lifted, transferred, and positioned throughout the production process. Large numbers of manual workers are required to perform these functions, and in 1960, the primary metal industries employed nearly a million blue-collar workers—more than 3 out of 4 workers in the industry.[50] Operatives accounted for one-third of the industry's work force. (See volume IV, appendix G.) Largest of the operative occupations were furnacemen, smelters, and pourers; welders and flame-cutters; drivers, and inspectors. The vast majority of operatives, however, performed specialized production jobs and are not identified separately but are grouped into "operatives, not elsewhere classified". Some examples of such jobs are piercer-machine operator (workers who run seamless tube making machines), bloom shearman (operators of hydraulic shears that cut blooms to length), and shakeout man (those who remove castings from molds).

Craftsmen, foremen, and kindred workers accounted for nearly 3 out of 10 workers in the primary metals major industry group. Cranemen, derrickmen, and hoistmen were employed extensively throughout the industry, particularly in the blast furnaces, steel works, and rolling mills industries, where skip operators, hot metal cranemen, ingot strippers, manipulator operators, and other skilled operators were needed to move vast quantities of metals safely and efficiently. Maintenance workers, especially those engaged in machinery repair and maintenance, also were one of the largest skilled occupations. Molders were one of the largest production occupations, accounting for nearly one-fourth of all the skilled workers in the "other" primary metals sector.

Rollers and roll hands, another important occupation, were employed mostly in the blast furnaces, steel works, and rolling mills industries, where they were engaged in jobs associated with rolling ingots into semifinished blooms, slabs, or billets. In 1960, laborers accounted for over 15 percent of total employment, about double the proportion for total durable goods manufacturing. Many of these laborers performed loading and unloading tasks, as well as cleanup duties. Others had specialized jobs such as shearman's helper, steel chipper, and scrap cutter. White-collar workers in primary metals made up only about one-fifth of the work force, compared with the average of nearly one-third for all durable goods manufacturing. About 1 out of 10 workers in primary metals was employed in a clerical job. Most of the remaining white-collar workers were about equally divided between the professional and managerial occupational groups.

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[50] Including self-employed and unpaid family workers, as well as wage and salary workers..

Technological developments are expected to have a significant effect on the occupational composition of the primary metal industries through the mid-1970's. For example, the proportion of laborers will decline sharply as new and improved loading and charging devices and other materials movement equipment, such as conveyors, sand feeders, and mold and flask-handling equipment, are used increasingly. The decline is expected to be particularly significant in foundries where materials handling workers represent one of the largest occupational groups. In the blast furnaces, steel works, and rolling mills industries, expanded use of the continuous casting process and automatic billet conditioners will reduce intermediate operations and handling of materials.

Although the proportion of laborers is decreasing, both craftsmen, foremen and kindred workers, and professional and technical workers will account for a larger share of primary metals employment by 1975. Although the ratio of craftsmen and foremen will increase, diverse trends are likely within this occupational group and the industry sectors. For example, foremen, millwrights, mechanics, and repairmen are each expected to increase as supervisory and maintenance requirements expand to meet the needs of an increasingly mechanized and technical metals industry. Greater instrumentation in the industry–particularly in the areas of basic oxygen steelmaking and continuous casting which are particularly adaptable to automatic control–is expected to increase the proportion of instrument repairmen. The percentage of cranemen, derrickmen, and hoistmen also should grow as materials handling operations and other manual jobs become increasingly mechanized.

On the other hand, improvements in the efficiency of molding machines and advances in close tolerance forging techniques are expected to reduce the proportion of both molders and machinists. Rollers and roll hands also will be adversely affected–both by the continuous casting process and by automated rolling and finishing operations controlled by computers. However, the relative position of these workers is likely to rise in the other primary iron and steel sector, since continuous casting techniques are not readily adaptable to this industry sector.

All major occupations within the professional, technical, and kindred occupational group will increase–many of them substantially–over the coming decade as greater emphasis is placed upon research and development activities and modernization of production facilities. More widespread use of the basic oxygen furnace and oxygen lances in blast furnaces and open-hearths are expected to increase the percentage of engineers and scientists. Some of these workers will be needed to develop mathematical models and pilot studies so that optimum benefits can be obtained from these new techniques. Other professional and technical workers–particularly metallurgical engineers–will be needed to engage in the metals industry's continuing search for alloys that are stronger, lighter, and more resistant to heat. Opportunities for electronic technicians, electronic computer programers, and other personnel trained in the preparation of data for use in computers also are expected to increase.

Fabricated Metal Products[51]

Current Employment

About 1.3 million wage and salary workers were employed in the fabricated metals industry in 1966 (See table 21) Almost 30 percent were employed in establishments manufacturing fabricated structural metal products, including fabricated structural steels, metal window and door frames, power boilers and storage vessels, and architectural and ornamental metalwork. Nearly 18 percent were employed in establishments producing metal stampings; 12 percent worked in establishments making cutlery, handtools, and general hardware; and 11 percent were in establishments producing miscellaneous fabricated metal products such as steel drums or pails, safes and vaults, or steel springs. The remaining workers were employed in establishments

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[51] SIC 34. This major group includes establishments engaged in fabricating ferrous and nonferrous metal products such as metal cans, tinware, hand tools, cutlery, general hardware, nonelectric heating apparatus, fabricated structural metal products, metal stampings, and a variety of metal and wire products not elsewhere classified. Certain important segments of the metal fabricating industries are classified in other major groups such as ordnance in SIC 19; machinery in SIC 35 and 36; transportation equipment in SIC 37; professional, scientific, and controlling instruments, watches and clocks in SIC 38; and jewelry and silverware in SIC 39. Establishments primarily engaged in producing ferrous and nonferrous metal and their alloys are classified in SIC 33.

Table 21. Distribution of Wage and Salary Workers in the Fabricated Metal Products Major Industry Group, by Industry, 1966

(In thousands)

SIC Code	Industry	Wage and salary workers		Production workers as percent of employment, by industry	Women workers as percent of employment, by industry
		Number	Percent distribution		
34	Fabricated metal products	1,349.1	100.0	77.8	17.0
341	Metal cans	64.8	4.8	84.9	17.9
342	Cutlery, hand tools, and general hardware	161.3	12.0	79.3	30.6
3421, 3, 5	Cutlery and hand tools, including saws	63.4	4.7	80.3	23.3
3429	Hardware, not elsewhere classified	98.0	7.3	78.6	35.4
343	Heating equipment and plumbing fixtures (except electric)	80.2	5.9	75.3	14.3
3431, 2	Sanitary ware and plumbers' brass goods	35.7	2.6	81.2	16.8
3433	Heating equipment, except electric	44.5	3.3	70.6	12.4
344	Fabricated structural metal products	397.7	29.5	72.8	8.6
3441	Fabricated structural steel	109.2	8.1	74.5	4.9
3442	Metal doors, sash, frames, and trim	65.6	4.9	72.1	16.5
3443	Fabricated plate work (broiler shops)	104.8	7.8	71.0	6.4
3444	Sheet metal work	74.0	5.5	73.0	10.5
3446, 9	Architectural and miscellaneous metal work	44.1	3.3	73.5	7.9
345	Screw machine products, bolts, etc.	107.9	8.0	79.5	19.9
3451	Screw machine products	50.1	3.7	85.4	22.0
3452	Bolts, nuts, screws, rivets, and washers	57.8	4.3	74.4	18.2
346	Metal stamping	235.9	17.5	81.6	18.7
347	Coating, engraving, and allied services	85.0	6.3	84.4	18.2
348	Miscellaneous fabricated wire products	66.2	4.9	81.4	23.7
349	Miscellaneous fabricated metal products	150.2	11.1	75.7	17.2
3491	Metal shipping barrels, drums, kegs, and pails	1/11.3	2/0.9	(3)	(3)
3492, 3, 6, 7, 9	Miscellaneous fabricated metal products, not elsewhere classified	1/48.1	2/3.6	(3)	(3)
3494, 8	Valves, pipe, and pipefitting	89.3	6.6	72.3	14.7

1/ Benchmark data for March 1966.

2/ Based on March 1966, total employment of the major industry group.

3/ Data are not available.

Note: Individual items may not add to totals because of the inclusion of benchmark data and/or rounding.

making screw machine products, and bolts, nuts, screws, rivets and washers; heating apparatus (except electrical) and plumbing fixtures; metal cans; miscellaneous fabricated wire products; and in establishments performing coating, engraving, and allied services.

Production workers accounted for 78 percent of total employment in this major industry group in 1966, compared with 74 percent for all manufacturing. The proportion of production workers in the individual industry groups within this major industry group ranged from 73 percent in the fabricated structural metal products industry group to 85 percent in both the metal cans industry group and the coating, engraving, and allied services industry group.

Women workers accounted for 17 percent of total employment in the fabricated metals industry in 1966, compared with 27 percent for all manufacturing employment. Among the individual industries in this major group, the proportion of women workers ranged from 8 percent in the fabricated structural metal products industry to 31 percent in establishments producing cutlery, hand tools, and general hardware.

Employment Trends and Outlook

Employment in establishments producing fabricated metal products increased from 989,000 in 1947 to over 1.3 million in 1966, an increase of 36 percent. This increase was considerably faster than employment growth for all manufacturing over the 19-year period. Production rose by 115 percent over this same period compared to a 139 percent increase in production for total manufacturing.

Between 1958 and 1966,[52] employment growth differed widely among the various fabricated metal products industry groups. Employment in establishments producing metal cans remained virtually unchanged. The growth in demand for metal cans was limited by competition from fiber-foil, plastic, and glass containers, and the increasing output per worker resulting from the greater use of laborsaving technological innovations. On the other hand, employment increased by 52 percent in establishments performing coating, engraving, and allied services, in response to a rising demand for plated parts such as bumpers.

Production workers declined as a proportion of total employment in this major industry group, from 84 percent in 1947 to 78 percent in 1966. Nearly all of this decrease occurred during the 1947-58 period; since 1958, the proportion of production workers to total employment has remained relatively unchanged.

Manpower requirements in the fabricated metal products industry are expected to rise from over 1.3 million to about 1.5 million between 1966 and 1975, an increase of nearly one-sixth. (See volume IV, appendix B) Although the high levels of economic activity anticipated in the decade ahead will stimulate output of fabricated metal products, employment will increase more slowly than output because of the growing application of laborsaving technological innovations such as numerically controlled machine tools and automatic processing and handling equipment.

Employment trends for the individual industries are expected to differ because of differences in demand and in the rates of adoption of laborsaving technological innovations. For example, employment requirements in establishments performing coating, plating, and allied services are expected to increase substantially because of rising demand. Since the production processes in these establishments already are highly mechanized, technological developments are not expected to have a significant impact on labor requirements. In contrast, employment requirements in establishments in the metal can industry are expected to decline slightly, primarily because of improvements in production machinery and procedures that will increase output per worker.

Occupational Structure

The production of varied fabricated metal products, such as cans, cutlery and metal stampings entails many sequences involving blue-collar activities. In 1960, more than 2 out of 3 persons[53] in this industry was a blue-collar worker, the majority of whom were operatives. (See volume IV, appendix G.) Since production operations in the industry are highly mechanized and assembly is an important aspect of the work, machine tool operators, assemblers, and inspectors accounted for a substantial proportion of all workers in the operative classification. Craftsmen, foremen, and kindred workers were the next largest blue-collar occupational group and represented about 1 out of 4 workers. Many craftsmen were employed as foremen, maintenance personnel, sheet metal workers, and tool and die makers. Most of the laborers employed in the industry were engaged in materials handling activities.

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[52] BLS employment (payroll) data for 4 industries–heating equipment and plumbing fixtures, metal stampings, coating engraving and allied services; miscellaneous fabricated wire products; and miscellaneous fabricated metal products–are not available for the years prior to 1958.

[53] Including self-employed and unpaid family workers, as well as wage and salary workers. The occupational patterns data for the fabricated metal products major industry group includes employment in the ordnance and accessories major industry group (SIC 19), except those employed in establishments producing sighting and fire control equipment (SIC 194). Because of the inclusion of ordnance employment (which has a high proportion of white-collar workers compared with the average for fabricated metal products establishments other than ordnance) in the occupational patterns data, the ratio of white-collar workers is somewhat higher and that for blue-collar workers is lower than would be the case if ordnance employment were excluded from the occupational patterns data.

White-collar workers accounted for about one-third of total employment in the fabricated metal products major industry group in 1960. Many of the professional and technical workers, particularly scientists, engineers, and technicians, were employed in ordnance establishments where they were engaged in the design, development, and production of military hardware such as missiles, tanks, and guns. The proportions of workers in the remaining white-collar major occupation groups—managers, officials, and proprietors; sales workers; and clerical workers—were higher than the average for durable goods manufacturing as a whole. These higher ratios of managers, proprietors, and sales workers reflected the large numbers of small establishments producing fabricated metal products. Clerical workers accounted for about one-seventh of total industry employment, slightly above the average for durable goods manufacturing.

Technological innovations are expected to affect some changes in occupational structure in fabricated metal establishments by 1975. Increasing use of automatic transfer equipment and numerically controlled machines, as well as other new developments such as welding and cutting with electronic beams, chemical milling and electro-chemical machining, and high energy forming methods should alter somewhat the composition of the operative occupational group. By performing more operations and doing them more accurately and quickly, such processes and equipment will tend to adversely affect operative occupations such as assemblers, electroplater, and machine tool operator. On the other hand, the proportions of welders is expected to increase as a result of the more extensive use of the welding process in metal fabrication. The proportion of laborers should decline because of improved materials handling techniques such as automated transfer and conveyor systems. Although the proportion of craftsmen is not expected to change very much during the next 10 years, like operatives, there will be some shifts within the occupational group. For example, because of the greater efficiency and speed of numerically controlled machine tools, the proportions of metalworking craftsmen, such as production and toolroom machinists, are expected to decline. On the other hand, the ratios of foremen and of mechanics and repairmen should rise as a result of needs for increased supervision and maintenance of new and more complex mechanical equipment.

Among the white-collar occupational groups, the proportion of professional and technical workers is expected to show the most significant change, increasing more than one-fourth by 1975. Engineers and technicians are among occupations that should undergo the most rapid growth. Their growth will stem largely from expanding research and development activities in the industry (particularly in ordnance establishments), and from expansion and modernization of production facilities. Among clerical workers, office machine operators will increase in relative importance because of the widespread adoption of ADP equipment. The use of this equipment will adversely affect employment in occupations such as accounting clerks, shipping and receiving clerks, and other workers performing routine clerical jobs.

Machinery, Except Electrical [54]

Current Employment

More than 1.9 million wage and salary workers were employed in the machinery, except electrical, major industry group in 1966. (See table 22.) About one-fourth of all workers were employed in establishments producing special industry machinery or general industry machinery. About 18 percent were in establishments manufacturing metalworking machinery; 15 percent were in establishments manufacturing construction, mining, and materials hauling machinery and equipment; and over 11 percent were in establishments manufacturing office equipment, including calculating and accounting machines. The remaining workers in this

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[54] SIC 35. This major industry group includes establishments engaged in manufacturing machinery and equipment, other than electrical equipment (SIC 36), and transportation equipment (SIC 37). Machines powered by built-in or detachable motors ordinarily are included in this major group, except for electrical household appliances (SIC 36). Portable tools, both electric and pneumatic powered, are included in this major group, but hand tools are classified in (SIC 34).

Table 22. Distribution of Wage and Salary Workers in the Machinery (Except Electrical) Major Industry Group, by Industry, 1966

(In thousands)

SIC Code	Industry	Wage and salary workers		Production workers as percent of employment, by industry	Women workers as percent of employment, by industry
		Number	Percent distribution		
35	Machinery, except electrical	1,911.1	100.0	70.4	13.5
351	Engines and turbines	99.1	5.2	69.1	12.9
3511	Steam engines and turbines	30.9	1.6	57.0	10.4
3519	Internal combustion engines, not elsewhere classified	68.1	3.6	74.7	14.0
352	Farm machinery and equipment	148.0	7.7	74.1	8.6
353	Construction and related machinery	277.8	14.5	68.5	8.4
3531, 2	Construction and mining machinery	151.3	7.9	70.9	7.3
3533	Oil field machinery and equipment	39.3	2.1	68.4	8.1
3534	Elevators and moving stairways	1/15.8	2/0.8	(3)	(3)
3535, 6	Conveyors, hoists, monorails, and industrial cranes	40.0	2.1	65.5	10.5
3537	Industrial trucks, tractors, trailers, and stackers	1/30.0	2/1.6	(3)	(3)
354	Metalworking machinery and equipment	335.5	17.6	75.9	10.9
3541	Machine tools, metal cutting types	79.6	4.2	70.1	8.9
3544	Special dies, tools, jigs, and fixtures	118.0	6.2	82.7	6.8
3545	Machine tool accessories	60.4	3.2	74.2	18.9
3542, 8	Miscellaneous metalworking machinery	77.6	4.1	72.7	12.9
355	Special industrial machinery	205.5	10.8	69.2	10.9
3551	Food products machinery	42.3	2.2	64.8	11.8
3552	Textile machinery	45.8	2.4	77.7	11.1
3554	Paper industries machinery	1/20.9	2/1.1	(3)	(3)
3555	Printing trades machinery	29.6	1.5	70.3	12.2
3553, 9	Special industrial machinery, not elsewhere classified	1/66.1	2/3.5	(3)	(3)
356	General industrial machinery	284.7	14.9	67.3	15.7
3561	Pumps; air and gas compressors	77.4	4.1	57.5	12.9
3562	Ball and roller bearings	63.3	3.3	78.8	23.9
3564	Blowers, exhaust and ventilating fans	1/28.5	2/1.5	(3)	(3)
3565, 7, 9	General industrial machinery and equipment, not elsewhere classified	1/60.4	2/3.2	(3)	(3)
3566	Mechanical power transmission equipment	53.6	2.8	74.8	13.1
357	Office, computing and accounting machines	217.1	11.4	59.1	27.1
3571	Computing machines and cash registers	167.5	8.8	56.2	26.4
3572	Typewriters	1/20.4	2/1.1	(3)	(3)
3576, 9	Scales, balances, and office machines, not elsewhere classified	1/26.9	2/1.4	(3)	(3)

See footnotes at end of table.

Table 22. Distribution of Wage and Salary Workers in the Machinery (Except Electrical) Major Industry Group, by Industry, 1966--Continued

(In thousands)

SIC Code	Industry	Wage and salary workers		Production workers as percent of employment, by industry	Women workers as percent of employment, by industry
		Number	Percent distribution		
358	Service industry machinery	126.2	6.6	70.0	13.9
3585	Refrigeration, except home refrigerators	79.6	4.2	70.1	12.3
3581, 2, 6, 9	Other service industry machinery	1/45.2	2/2.4	(3)	(3)
359	Miscellaneous machinery	217.3	11.4	78.9	13.2

1/ Benchmark data for March 1966.
2/ Based on March 1966, total employment in the major industry group.
3/ Data are not available.

Note: Individual items may not add to totals because of the inclusion of benchmark data and/or rounding.

major industry group were employed in establishments manufacturing engines and turbines, farm machinery and equipment, service industry machinery, and miscellaneous machinery.

Production workers accounted for 70 percent of total employment in the machinery, except electrical, major industry group in 1966, compared with 74 percent for all manufacturing. The majority of individual industry groups within the major industry group had about the same proportion of production workers. However, the proportion was somewhat higher in the metalworking and miscellaneous machinery industry groups, and the proportion was somewhat below the average in the office machinery industry group.

Women workers accounted for about 14 percent of total employment in the machinery industry establishments in 1966, compared with 27 percent for all manufacturing. Among the individual industry groups, the proportions of women ranged from 8 percent in establishments producing farm machinery and equipment to 27 percent in establishments manufacturing office, computing, and accounting machinery.

Between 1958 and 1966,[55] employment rose in all of the machinery industry groups, although the rates of growth differed widely. Employment in the engines and turbines industry group was only about 10 percent higher in 1966 than in 1958 because the demand for products, such as navy and marine steam turbines, increased at a slow pace. In contrast, employment advanced very rapidly (63 percent) in the accounting, computing, and office machine industry group, primarily because of an accelerated demand for computers. Rapid employment growth also occurred in establishments producing general industry machinery, miscellaneous machinery, and metalworking machinery (primarily machine tools). In the latter establishments, employment gains reflected the expansion and modernization of the domestic metalworking industries, particularly the automotive industry, the largest user of machine tools.

Because of the general increase in the demand for personal services, employment also rose moderately in establishments manufacturing service industry machinery, such as vending machines and dry cleaning equipment. In addition, employment in establishments producing construction, mining, and materials handling equipment rose rapidly, reflecting increased demand for machinery and equipment used in mining, logging, agriculture, oil fields, land reclamation, irrigation, power and communications systems, and municipal maintenance, as well as general construction. The greater use of materials handling equipment in many industries has contributed to the growth of this industry group. Employment also gained rapidly in the industry groups manufacturing farm machinery and special industry machinery reflected the replacement of obsolete equipment and increased demand for the products of direct user industries such as textiles, paper and paper products, and foods. The demand for these products was stimulated by an increasing population and rising levels of personal disposable income.

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[55] BLS employment (payroll) data for most of the industry groups are not available for the years prior to 1958.

Although the total number of production workers in this major industry group increased (12 percent) over the 1947-66 period, production workers decreased as a proportion of total employment, from 79 percent in 1947 to about 70 percent in 1966. The decrease occurred primarily between 1947 and 1958.

Manpower requirements in this major industry group are expected to increase to over 2 million by 1975. (See volume IV, appendix B.) Employment is expected to grow as a result of the rising demand for machinery and related equipment. Expenditures for new plant and equipment are expected to grow and will stimulate the demand for machinery and equipment. In addition, a high proportion of machinery currently in use is obsolete and will have to be replaced. For example, as of 1963, 64 percent of the metalcutting machinery in use was at least 10 years old, and 20 percent was more than 20 years old. Also, the rules governing depreciation allowances have been changed to allow a more rapid depreciation of new machinery and equipment. Federal tax law changes, which allow income tax credit for new investments in plant and equipment, also will stimulate the demand for machinery.

Employment trends for individual industries within the major industry group are expected to differ only slightly between 1965 and 1975. For example, worker requirements are expected to increase at a faster pace in establishments producing special industry machinery, such as food processing machinery, textile machinery, paper industries machinery, and printing trades machinery. Expanding population and rising levels of personal disposable income will result in a greater demand for food, clothing, and furniture, as well as for paper and paper products. Manpower requirements also are expected to increase substantially in the machine tool industries. The growing use of numerically controlled equipment should increase machine tool orders. However, greater demand for numerically controlled equipment may reduce in part, orders for conventional machines.

Employment in the construction, mining, and materials handling machinery and equipment industries is expected to be spurred by rising construction activity to meet the needs of an increasing population. In addition, emphasis on cost-reduction and more efficient materials movement will increase the need for mechanized materials handling equipment.

Occupational Structure

Operatives accounted for the largest occupational group[56] in the machinery, except electrical, major industry group in 1960–about 35 percent. (See volume IV, appendix G) Metalworking occupations, such as machine tool operators, assemblers, and welders, accounted for one-half of the operative group, reflecting the extensive use of sophisticated metalworking equipment.

Craftsmen were the next largest occupational group, representing nearly 3 out of 10 workers. Significantly large occupations in this group were tool and die makers, mechanic and repairmen, and foremen. Professional and technical workers were the largest white-collar occupational group, making up almost 10 percent of total employment, about average for durable goods manufacturing.

Occupational structure differed significantly within the industry in 1960–mainly between office, computing and accounting equipment and the other industry groups. The proportions of professional and technical workers and sales workers were more than twice as high in the manufacture of office, computing and accounting equipment than in the remainder of the major industry group. The emphasis on research and development activities and the complex nature of production processes resulted in a high ratio of scientists, engineers, and technicians in office, computing and accounting equipment manufacturing. Sales workers represented a particularly high proportion of the work force, mainly because of the intensive competition for sales between firms producing computing and accounting equipment.

The occupational structure in the machinery, except electrical, major industry group is expected to change significantly by 1975, primarily because of the impact of technology on occupational requirements and a rapid growth in the office, computing and accounting equipment industry group. A large increase in the proportion of professional and technical workers–rising by about two-fifths from 1960–is expected in this major industry group. Although all industry segments will participate in this shift, the computer and accounting machine segment will contribute greatly to the overall trend by boosting its proportion of these workers by more than one-half, and by gaining more than twice as rapidly in total employment as the major industry group as a whole. The expected growth in the proportion of professional and technical workers can generally be attributed to the continuing emphasis on research and development activities. The spreading use of numerically-controlled machine tools also will tend to raise requirements for engineers, programers, and technicians at the expense of skilled and semiskilled machine tool operators and tool and die makers.

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[56] Including self-employed and unpaid family workers, as well as wage and salary workers.

The proportion of laborers is expected to decline nearly one-third by 1975, reflecting mainly the more intensive application of materials handling equipment and work feeding devices. The use of automatic transfer equipment will grow rapidly, especially in plants making large quantities of standardized products, and will adversely affect employment of materials handlers. The increasing application of instrumentation and computer control will decrease the proportion of inspectors and machine tool operators, but raise manpower requirements in such occupations as instrument repairmen. In addition, the more extensive application of electronic computers will tend to lower requirements for some clerical workers; however, the overall proportion of these workers is expected to remain relatively unchanged.

The overall trends in the occupational structure are expected to be reversed in some sectors of the major industry group. For example, the ratio of operatives is expected to increase in farm machinery and equipment, primarily because of an anticipated rise in the proportion of welders and flame cutters, attributable to the greater importance of welding in this industry. Moreover, the proportion of assemblers in office, computing and accounting machines is expected to rise, reflecting a shift in the product mix from office and accounting machines to computers. Operatives in the office, computing and accounting machine industry group, however, are expected to decline proportionately, mainly because technicians will be increasingly needed as production processes become more complex.

Electrical Machinery, Equipment and Supplies[57]

Current Employment

About 1.9 million wage and salary workers were employed in the electrical machinery, equipment, and supplies major industry group in 1966. (See table 23.) About half were employed in the three industry groups primarily engaged in manufacturing electronic products–communications equipment; electronic components; and radio and television sets and other home entertainment equipment. (About 50 percent of the workers in electronics manufacturing establishments were estimated to be engaged in the manufacture of military and space products.) The remaining employees in this major industry group were employed in the five industry groups primarily engaged in manufacturing electrical lighting and wiring equipment, electrical distribution equipment, and miscellaneous electrical equipment and supplies.

Production workers accounted for 69 percent of total employment in this major industry group in 1966, compared with about 74 percent in manufacturing as a whole. Among the individual electrical machinery, equipment and supplies industry groups, the proportion of production workers ranged from about 50 percent in the communications equipment industry group to 80 percent in the radio and TV receiving sets industry group. The relatively low proportion of production workers in the communications equipment industry group reflected the extensive employment of scientific and technical manpower needed in the development and production of military and space electronic products.

Women workers accounted for 40 percent of total employment in electrical machinery, equipment and supplies establishments in 1966, compared with 27 percent in all manufacturing. In two industry groups--radio and TV receiving sets and electronic components and accessories–the proportion of women workers was more than twice as high as in all manufacturing. Women made up a relatively high proportion of the work force in the electrical machinery, equipment, and supplies major industry group, mainly because many production operations center around the assembly, inspection, and testing of lightweight, very small products--work often performed by women.

Employment Trends and Outlook

Employment in this major industry group increased by more than 83.2 percent between 1947 and 1966, from slightly more than 1 million to nearly 1.9 million workers. This rate of increase was almost four times as fast as the rate for all manufacturing employment. During the same period, production of electrical ma-

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[57] SIC 36. This major group includes establishments engaged in manufacturing machinery, apparatus, and supplies for the generation, storage, transmission, transformation, and utilization of electrical energy; and in manufacturing household appliances.

Table 23. Distribution of Wage and Salary Workers in the Electrical Machinery, Equipment and Supplies Major Industry Group, by Industry, 1966

(In thousands)

SIC Code	Industry	Wage and salary workers		Production workers as percent of employment, by industry	Women workers as percent of employment, by industry
		Number	Percent distribution		
36	Electrical machinery, equipment, and supplies	1,896.4	100.0	69.4	40.4
361	Electrical distribution equipment	189.8	10.0	68.8	31.8
3611	Electric measuring devices	65.7	3.5	67.4	43.1
3612	Power distribution transformers	51.0	2.7	70.8	24.9
3613	Switchgear and switchboard apparatus	73.1	3.9	68.7	26.3
362	Electrical industrial apparatus	214.3	11.3	71.2	32.6
3621	Motors and generators	117.6	6.2	71.7	32.1
3622	Industrial controls	57.9	3.1	67.2	38.7
3624	Carbon and graphite products	1/12.8	2/0.7	(3)	(3)
3623, 9	Other electrical industrial apparatus	1/25.0	2/1.4	(3)	(3)
363	Household appliances	181.3	9.6	78.8	22.6
3632	Household refrigerators and freezers	57.8	3.0	82.0	13.1
3633	Household laundry equipment	26.0	1.4	76.5	13.5
3634	Electric housewares and fans	45.8	2.4	78.6	47.2
3636	Sewing machines	1/ 8.9	2/0.5	(3)	(3)
3631, 5, 9	Other household appliances	1/38.1	2/2.0	(3)	(3)
364	Electrical lighting and wiring equipment	193.1	10.1	78.1	42.2
3641	Electrical lamps	34.0	1.8	88.5	66.5
3642	Lighting fixtures	62.6	3.3	77.6	31.3
3643, 4	Wiring devices	96.5	5.1	74.7	40.5
365	Radio and TV receiving sets	159.8	8.4	79.5	56.8
366	Communications equipment	465.5	24.5	50.4	34.7
3661	Telephone and telegraph apparatus	128.2	6.8	67.9	43.6
3662	Radios and TV communications equipment	337.4	17.8	43.7	31.4
367	Electronic components and accessories	381.5	20.1	76.6	60.1
3671-3	Electron tubes	74.5	3.9	71.7	51.1
3674, 9	Electronic components, NEC and supplies	307.0	16.2	77.9	62.3
369	Miscellaneous electrical equipment	111.3	5.9	77.3	28.6
3691	Storage batteries	1/20.5	2/1.1	(3)	(3)
3692	Primary batteries	1/10.0	2/0.5	(3)	(3)
3694	Electrical equipment for engines	60.3	3.2	79.1	27.4
3693, 9	Miscellaneous electrical machinery, NEC	1/16.8	2/0.9	(3)	(3)

1/ Benchmark data for March 1966.
2/ Based on March 1966, total employment in the major industry group.
3/ Data are not available.

Note: Individual items may not add to totals because of the inclusion of benchmark data and/or rounding.

chinery, equipment, and supplies rose by 264 percent, almost twice the growth for total manufacturing production.

In recent years, employment and output in industries primarily engaged in manufacturing electronic products have increased faster than industries primarily producing electrical items. Between 1958 and 1966,[58] the combined employment in the three industry groups manufacturing electronics rose 74 percent, while employment in the five electrical manufacturing groups rose 33 percent. A high proportion of the electronics shipments were military and space products.[59] Many of these products were complex, low volume items, which were not produced by mass production methods. On the other hand, many of the production processes in the electrical products industries involved the fabrication of metal or plastic parts, many of which were mass produced.

Production workers decreased as a proportion of total employment in this major industry group, from 78.1 percent in 1947 to 69.4 percent in 1966. However, between 1958 and 1966, the relative importance of production workers did not change significantly because a sharp decline in the ratio of production workers in establishments manufacturing communications equipment was offset by increases in all other industry groups. The relative importance of production workers decreased rapidly in the communications equipment industry group, in large part, because of the rapid growth in the employment of scientific and technical personnel engaged in research and development activities; and in the production of increasingly complex equipment, particularly military and space electronics products.

Manpower requirements in the electrical machinery, equipment and supplies major industry group are expected to increase by about 6 percent to about 2 million by 1975, despite the growing application of laborsaving technological innovations. (See volume IV, appendix B.) Increased employment is expected to result from a rapidly rising demand for electronic and electrical products, particularly electronic products. This projection assumes that the demand for military products will continue to rise at about the same rate as that experienced during the late 1950's and early 1960's, but considerably below the sharp 1965 and 1966 increases resulting from the Viet Nam buildup. By 1975, establishments manufacturing such products will continue to account for a high proportion of electronic employment. The demand for other products is expected to grow rapidly because of rising levels of general economic activity and greater use of electrical and electronic products in the home and industry.

The demand for electrical equipment also should be stimulated by improvements in urban transportation, including the construction of subway systems that use electric power; by the construction of atomic powered electric utility systems; and by the installation of underground transmission systems. The automation of many industrial processes will stimulate demand for electric products. It is anticipated that the growing consumer and commercial markets for electronic equipment also will greatly increase the demand for electronic components. The growth in population and family formation and the higher levels of personal spendable income are expected to provide booming markets for consumer and consumer-related items. Electrical and electronic systems also will play a significant role in telecommunications, underwater research, medicine, electroluminescense, and optical technology.

Occupational Structure

Operatives accounted for more than 4 out of 10 workers[60] in this major industry group—one of the highest proportions for a durable manufacturing group. (See volume IV, appendix G.) Large numbers of assemblers and inspectors were employed, reflecting the relatively low level of mechanization in the assembly process for complex electronic products. Professional and technical workers were the largest white collar occupational group, accounting for about one-sixth of the industry's work force. Engineers and technicians (including draftsmen) accounted for more than 3 out of 4 of these workers—a high ratio for a manufacturing industry. The higher proportion of engineers and technicians reflects the emphasis on research and development activities and the need for technically trained workers in the production process. Craftsmen constituted nearly 16 percent of total employment—more than one-quarter of whom were foremen. Clerical workers made up about 15 percent and laborers, less than 3 percent of employment.

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[58] BLS employment (payroll) data for the individual industry groups are not available for the years prior to 1958.

[59] Almost half of total electronics shipments were channeled into the Nation's military and space efforts each year between 1958 and 1965, according to the Electronics Industries Association's *1965 Electronic Industries Yearbook.*

[60] Including self-employed and unpaid family workers, as well as wage and salary workers.

Occupational structures were significantly different between establishments primarily engaged in the production of electronic products and those producing electrical products. Moreover, differences existed in the occupational patterns of establishments by type of electronic or electrical products manufactured. Generally, plants producing electrical products have a much lower proportion of professional and technical workers and a higher proportion of craftsmen than plants producing electronic products. However, professional and technical workers and clerical workers accounted for a higher proportion of employment in establishments manufacturing military-space electronic products than they did in plants producing other types of electronic products. The emphasis on research and development activities and the large number of technicians required to assemble and inspect complex, low-volume products resulted in a high proportion of scientists and engineers in plants producing military-space products. The large number of clerical workers in these establishments were required to perform the paperwork generated by defense and space related business activities, and to support the professional and technical personnel. In contrast, the ratio of professional and technical workers is lower in establishments manufacturing consumer electronic and electrical products, such as radio and television sets and household appliances. These plants have a higher proportion of operatives because most consumer items are produced in great quantities and require many separate assembly, inspecting, and testing operations.

The occupation structure in the electrical machinery, equipment and supplies major industry group is expected to shift slowly by 1975; the greatest changes being the sharp increase in the proportion of professional and technical workers and the decreasing proportion of clerical workers. The high proportion of engineers and technicians in 1960 is expected to rise further as expenditures for research and development activities continue to grow, and as technicians find employment, for example, in plants shifting from conventional switching devices to microcircuits. Also, a rapid growth of employment in establishments producing electronic products (relative to those producing electrical products) is expected to reinforce this trend. However, some professional and technical occupations are expected to decrease by 1975. For example, the greater use of computer-controlled and other drafting techniques is expected to reduce engineering detail time and adversely affect employment of draftsmen.

The proportion of clerical workers is expected to decline for two reasons. First, the increasing use of electronic data processing systems will reduce the need for some kinds of clerical workers. The rising demand for workers to operate peripheral computer equipment, however, will somewhat offset this affect. Second, more rapid growth in consumer-industrial products is expected, where the proportion of clerical workers is lower than in the remainder of the major industry group.

In the operative occupational group, the shift in product mix in favor of consumer-industrial products will tend to increase requirements for assemblers and inspectors at the same time that technological change will be tending to reduce requirements for these workers. The net effect of these contrasting trends is that the ratios of assemblers and inspectors are expected to decline between 1960 and 1975.

The proportions of skilled craftsmen and foremen are expected to increase only slightly by 1975. However, significant changes are expected within the occupational group. The proportion of foremen will increase, reflecting the close supervision required by increasingly sophisticated manufacturing processes. Mechanics and repairmen are expected to rise by about one-third because of the need to maintain the greater number of complex machinery. As in most major industry groups, the proportion of laborers will continue to decline, mainly because of the continued application of automatic conveyor systems.

Transportation Equipment[61]

Current Employment

More than 1.9 million wage and salary workers were employed in the transportation equipment major industry group in 1966. (See table 24.) About 45 percent were employed in the motor vehicle and motor vehicle equipment segment and nearly 40 percent were employed in the aircraft and aircraft parts group. The remaining workers were employed in ship and boat building and repairing; railroad equipment manufacturing and re-

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[61] SIC 37. This major group includes establishments engaged in manufacturing equipment for transportation of passengers and cargo by land, air, and water. Important products produced by establishments classified in this major group include motor vehicles, aircraft, ships, boats, railroad equipment, and miscellaneous transportation equipment such as motorcycles and bicycles.

Table 24. Distribution of Wage and Salary Workers in the Transportation Equipment Major Industry Group, by Industry, 1966

(In thousands)

SIC Code	Industry	Wage and salary workers		Production workers as percent of employment, by industry	Women workers as percent of employment, by industry
		Number	Percent distribution		
37	Transportation equipment	1,911.5	100.0	71.2	10.3
371	Motor vehicles and motor vehicle equipment	859.2	44.9	77.8	8.6
3711	Motor vehicles	361.5	18.9	74.2	6.4
3712	Passenger car bodies	65.3	3.4	81.5	7.7
3713	Truck and bus bodies	36.8	1.9	81.0	6.3
3714	Motor vehicle parts and accessories	368.4	19.3	80.4	11.4
3715	Truck trailers	1/28.5	2/1.5	(3)	(3)
372	Aircraft and parts	750.5	39.3	59.3	14.2
3721	Aircraft	417.3	21.8	57.5	14.7
3722	Aircraft engines and parts	208.1	10.9	57.4	13.2
3723, 9	Other aircraft parts and equipment	125.1	6.5	68.3	14.2
373	Ship and boat building and repairs	176.4	9.2	83.2	3.6
3731	Ship building and repairing	142.8	7.5	83.1	3.2
3732	Boat building and repairing	33.7	1.8	83.1	5.6
374	Railroad equipment	61.6	3.2	78.9	5.7
3741	Locomotives and parts	1/19.7	2/1.0	(3)	(3)
3742	Railroad and streetcars	1/40.1	2/2.1	(3)	(3)
375, 9	Other transportation equipment	63.8	3.3	82.3	11.6

1/ Benchmark data for March 1966.
2/ Based on March 1966, total employment in the major industry group.
3/ Data are not available.

Note: Individual items may not add to totals because of the inclusion of benchmark data and/or rounding.

pairing; motorcycles, bicycles, and parts manufacturing; and miscellaneous transportation equipment manufacturing.

Production workers accounted for 71 percent of total employment in this major industry group in 1966, compared with 74 percent for all manufacturing. The proportion of production workers in the sectors within the major industry varied from 59 percent in aircraft and parts to approximately 83 percent in ship and boat building and repair.

Women workers accounted for about 10 percent of total employment in the transportation equipment major industry group, compared to 27 percent for all manufacturing. Among the individual industry groups, the proportion of women workers ranged from only 4 percent in ship and boat building and repair to 14 percent in aircraft and parts.

Employment Trends and Outlook

Employment in the transportation equipment industry increased from about 1.3 million in 1947 to over 1.9 million in 1966. This 50 percent increase was more than twice as fast as employment growth in all manufacturing. During the same period, production nearly tripled and was more than twice the rate of increase for all manufacturing.

Between 1947 and 1966, employment trends among the individual industries differed widely. Employment fluctuated considerably in the motor vehicle group, ranging between a high of 917,000 in 1953 and a low of 606,000 workers in 1954. (See statement on motor vehicles.) In contrast, employment increased rapidly between 1947 and 1957 in aircraft and parts from 239,000 to 896,000. Most of this growth resulted from overall increases in government procurement of aircraft and missiles, rising developmental and manufacturing demands for space vehicles, and increased demand for commercial airplanes during that period. Employment declined to 605,000 by 1964 as government expenditures leveled off prior to the Viet Nam buildup. Since 1964, employment has risen sharply because requirements for military aircraft have increased.

Employment in ship and boat building and repair has fluctuated between 1947 and 1966. Employment fell in the years immediately following World War II, as Government expenditures for shipbuilding declined and many ships were relegated to the "moth ball fleet." Sharp increases in defense expenditures during the Korean emergency and the Viet Nam buildup have caused temporary increases in employment in this industry.

Employment in the railroad equipment industry declined significantly over the 1947-66 period. The conversion from steam to diesel locomotives that began at the end of World War II was virtually completed by 1958. Most of the production activity after 1958 has been devoted to the repair, modification, and replacement of existing diesel locomotives and freight cars, and to the production of parts.

Employment increased rapidly between 1958 and 1966[62] in establishments manufacturing other transportation equipment such as motorcycles, bicycles, and trailer coaches.

Production workers decreased as a proportion of total employment in the transportation equipment major industry group, from about 8 out of 10 workers in 1947 to 7 out of 10 in 1966. Most of this decrease took place prior to 1958. Since 1958, the proportion of production workers to total employment has remained relatively stable.

Manpower requirements in the transportation equipment major industry group are expected to decline by 1975 to about the levels of the period prior to the Viet Nam buildup. Employment requirements in the motor vehicles sector are expected to decline as increases in production are more than matched by rising output per worker. (See volume IV, appendix B.) Manpower requirements also are expected to decline in the aircraft and parts sector as military demands for aircraft decrease to pre-Viet Nam levels, and output per worker increases more than the growth in the production of commercial aircraft.

Employment in the other industries—ship and boat building, railroad equipment, and other transportation equipment—are expected to increase moderately. However, changes in government shipbuilding and policy could affect the level of employment projected in shipbuilding.

Occupational Structure

Production methods in the transportation industry vary widely—from a very high degree of mechanization in the motor vehicle and equipment industry to substantially custom work in boatbuilding and repairing. As a result, occupational manpower needs are equally diverse. (See volume IV, appendix G.)

For example, as a percentage of total employment in 1960,[63] operatives varied from more than half in motor vehicles, where large numbers of operatives—particularly assemblers—were required for assemblyline work, to slightly more than one-fifth in boatbuilding and repairing, where the custom and complex nature of ship construction and repairs limited the degree of work simplification. However, because it's composed of metal working and metal fabrication industries, the transportation equipment major industry group, as a whole, employed significant numbers of assemblers and machine tool operators in 1960. Welders and flame cutters were employed in large numbers, including particularly high proportions in railroad equipment and boatbuilding and repairs, where the welding process is used widely in the construction of freight cars and ship hulls.

The percentage of skilled workers in boatbuilding and repairing (50 percent) was much higher than the average for the transportation equipment major industry group in 1960 because of the high skill requirements needed for both construction and maintenance of ships. Carpenters, structural metal workers, and machinists were the most common occupations within boatbuilding and repairing. Carpenters were used extensively in construction and repair of wood boats; machinists for construction, repair, and refitting work; and structural workers for construction of large ships. Because of the high degree of mechanization in the transportation equipment major industry group, a high ratio of mechanics and repairmen were found throughout all sectors of the industry.

Professional and technical workers accounted for nearly 14 percent of the transportation equipment industry's work force in 1960. Although this ratio was somewhat above the average for all durable goods manufacturing, it results primarily from the especially high concentration of professional and technical workers in the aircraft industry. This industry engages heavily in research and development activities, and accordingly, nearly one-fourth of its work force was classified as professional or technical workers. Engineers alone accounted for over 12 percent of the workers in the aircraft industry. Thus, despite relatively lower engineering ratios in each of the other three sectors of the industry, engineering was the second largest occupation in the transportation equipment major industry group.

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[62] BLS employment (payroll) data for 2 industries—motorcycles, bicycles and parts; and miscellaneous transportation equipment—are not available prior to 1958.

[63] Including self-employed and unpaid family workers, as well as wage and salary workers.

Clerical workers were employed in large numbers in the aircraft industry. Many of these workers are engaged in assisting the large number of engineers and technicians employed by this industry.

The ratio of laborers in the transportation equipment major industry group in 1960 was less than half of the average for all durable goods manufacturing. Few laborers are required because of the high degree of mechanization in the motor vehicles and equipment and aircraft and parts industries.

Laborers were most prevalent in the boat building and repairing and railroad and miscellaneous transportation equipment industries, the latter industry employing large numbers of laborers in its trailer and coach sector.

Some changes in the occupational structure of the transportation equipment major industry group can be expected by 1975 as a result of technological innovations. The most significant changes are expected in the professional-technical occupational groups of the motor vehicles and equipment and the aircraft and parts industry sectors. (See individual statements that follow.) Most of the anticipated rise of these workers is attributable to increasing requirements for engineers and technicians in research and development activities. Requirements for clerical workers performing repetitive routine will be reduced by the computer. The proportion of blue-collar workers in transportation equipment is expected to decline slightly, as greater use of laborsaving innovations substantially lowers requirements for laborers in each of the industry sectors. Also among the craftsmen group, increasing use of such innovations as numerically controlled machining will tend to reduce requirements for machinists and tool and die makers.

In general, the occupational structure in the ship and boat building and repairing industry sector is expected to follow the trend in the transportation equipment major industry group as a whole–higher concentrations of professional and technical workers, such as engineers and designers, and lower ratios of laborers. Developments such as the "Telerex" plate cutting process could reduce requirements for occupations involved in line development, patternmaking, and platemarking and shaping. On the other hand, the increasingly complex machines and equipment used in the industry could result in higher proportions of mechanics to repair them and foremen to supervise their operation.

Except for a significant decline in the proportion of laborers, little change is expected in the occupational structure of the miscellaneous transportation equipment groups during the next 10 years. Few changes are anticipated among craftsmen occupations. However, carpenters, sheetmetal workers, mechanics, and cabinetmakers are expected to increase somewhat as a result of the more rapid growth expected in the trailer and coach sector, where larger numbers of these craftsmen are employed.

Motor Vehicles and Motor Vehicle Equipment[64]

Current Employment

More than 859,000 wage and salary workers were employed in the motor vehicle and motor vehicle equipment industry in 1966. (See table 25.) Over 40 percent worked in establishments manufacturing or assembling complete passenger cars, trucks, commercial cars and buses, and special purpose motor vehicles. Another 40 percent were employed in establishments producing motor vehicle parts and accessories. The remaining workers were in establishments assembling passenger car, truck, and bus bodies; or in establishments manufacturing truck trailers and truck trailer chassis.

Production workers accounted for 78 percent of total employment in the motor vehicle and equipment industry in 1966, compared with 74 percent for all manufacturing. The individual industries constituting the

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[64] This industry group includes establishments primarily engaged in manufacturing or assembling complete passenger cars, trucks, commercial cars and buses (except trackless trolleys), and special purpose motor vehicles (SIC 3711); establishments primarily engaged in manufacturing passenger car bodies (SIC 3713); establishments primarily engaged in manufacturing motor vehicle parts and accessories (SIC 3714); and establishments primarily engaged in manufacturing truck trailers and truck trailer chassis (SIC 3715).

Table 25. Distribution of Wage and Salary Workers in the Motor Vehicles and Motor Vehicle Equipment Industry Group, by Industry, 1966

(In thousands)

SIC Code	Industry	Wage and salary workers		Production workers as percent of employment, by industry	Women workers as percent of employment, by industry
		Number	Percent distribution		
371	Motor vehicles and motor vehicle equipment	859.2	100.0	77.8	8.6
3711	Motor vehicles	361.5	42.1	74.2	6.4
3712	Passenger car bodies	65.3	7.6	81.5	7.7
3713	Truck and bus bodies	36.8	4.3	81.0	6.3
3714	Motor vehicle parts and accessories	368.4	42.9	80.4	11.4
3715	Truck trailers	1/28.5	2/3.2	(3)	(3)

1/ Benchmark data for March 1966.
2/ Based on March 1966, total employment in the industry group.
3/ Data are not available.

Note: Individual items may not add to totals because of the inclusion of benchmark data and/or rounding.

motor vehicle and equipment industry group had about equal proportions of production workers. Women workers accounted for only 9 percent of total employment in the industry, a percentage well below the average for all manufacturing.

Employment Trends and Outlook

Between 1947 and 1966, employment in the motor vehicle and equipment industry fluctuated between 606,000 and 917,000, reflecting the cyclical pattern of motor vehicle production and, to some extent, changes in the pattern of defense expenditures. Although employment fluctuated from year to year, the employment trend was generally downward between 1953 and 1958 and has been generally upward since. In contrast, the trend in motor vehicle production has been more steadily upward, nearly doubling between 1953 and 1966. Technological innovations, such as automatic fabrication and assembly operations, have limited employment growth.

Although motor vehicle production for civilian use was resumed in the latter part of 1945, it did not reach prewar levels until 1947. Employment rose from 768,000 in 1947 to an all time high of 917,000 in 1953. This record employment level set in 1953 was the result of a very high output of civilian motor vehicles (7.3 million) coupled with defense production resulting from the Korean Conflict. Employment dropped to about 766,000 in 1954 because a cutback in defense spending and a general contraction of economic activity caused output to drop. In the following year, employment rebounded to 891,000 as a combination of favorable forces—good business conditions, easy credit, and major styling changes—spurred production to an unprecedented high of 9.2 million vehicles.

Employment declined steadily after 1955 to a postwar low of 607,000 in 1958, a recession year in which only 5.2 million vehicles were produced. Production rose steadily from 1961 and reached an all time high of 11.1 million motor vehicles in 1965. Employment was 859,000 in 1966, the third highest employment figure in the industry's history.

Production workers decreased slightly as a proportion of total employment in this industry group, from 82 percent in 1947 to 78 percent in 1966. However, this proportion has remained relatively stable since 1959.

Manpower requirements in this industry group are expected to decline between 1966 and 1975, to about 790,000, as substantial growth in the production of motor vehicles and equipment is more than matched by increases in output per worker. (See volume IV, appendix B.) Production will be spurred by increases in population, households, and multicar ownership. Technological innovations that are expected to have a significant effect on the employment requirements in this industry through the mid-1970's include the increasing use of computers, numerically controlled machine tools, and increased mechanization of existing manufacturing processes.

Occupational Structure

Skilled mechanics are required to repair automobiles, but many semiskilled workers are needed to build them. These variances in skill requirements are attributable, in part, to the work simplification techniques of assembly line production. In 1960, over half of the work force[65] in the motor vehicle and equipment industry were operatives. (See volume IV, appendix G.) Semiskilled metal working occupations, such as inspectors, welders, or machine tool operators, alone accounted for nearly one-third of the industry's work force. Large numbers of mechanics and repairmen, machinists, and electricians also are employed to install, maintain, and repair production equipment. The percentage of skilled workers in 1960 (nearly 23 percent) was about the same as the average for all durable goods manufacturing. White-collar employees–almost half of them clerical workers–accounted for one-fifth of total employment in 1960. Among the professional, technical, and kindred group, engineers and technicians were the largest occupations.

Technological developments are expected to affect the motor vehicle and equipment industry's occupational structure moderately by 1975. The most significant change will occur in the proportion of professional and technical workers whose percentages are expected to increase in response to expanded research, development, design, and engineering activities. On the other hand, the introduction of drafting machines and computer assisted systems is expected to slow the rate of increase experienced by these workers in past years. Programers and systems analysts are among jobs likely to become more prevalent.

The percentage of skilled workers is expected to decline as greater use of automatic equipment lowers the relative requirements for these workers. Tool and die maker, pattern maker, and machinist are among occupations likely to be adversely affected by such developments as the introduction of electronic and numerical control machining. However, the proportions of mechanics and repairmen, and electricians, needed to install and maintain such new equipment, are expected to increase.

Increased mechanization will reduce the need for some operatives, but this trend is expected to be offset by increases in the number of machine operation jobs formerly performed by skilled workers. Little change is expected in the proportion of operatives employed in the industry. Continuing mechanization will tend to reduce the needs for some semiskilled jobs while increasing others. Assemblers–the largest occupational group of semiskilled workers are expected to decline due to increasing use of machines that can perform automatically such assembly operations as screwdriving, nut running, and riveting. On the other hand, mechanization will increase the need for certain semiskilled machine operators as the trend towards work simplification continues.

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[65] Including self-employed and unpaid family workers, as well as wage and salary workers.

Aircraft and Parts[66]

Current Employment

Approximately 750,000 wage and salary workers were employed in the aircraft and parts industry group in 1966. (See table 26.) More than 8 out of 10 workers were concentrated in two industries–aircraft, which employed over half of the industry's workers; and aircraft engines and engine parts, which accounted for over one-fourth. The remaining workers were employed in industries producing aircraft propellers and propeller parts or other aircraft parts and auxiliary equipment.

Production workers accounted for 59 percent of total employment in the aircraft and parts industry in 1966, compared to 74 percent for all manufacturing. The individual industries within this industry group had about the same proportion of production workers. Women workers accounted for 14 percent of total employment in this industry, about half the average for all manufacturing.

Employment Trends and Outlook

Employment in the aircraft and parts industry nearly tripled between 1947 and 1957, growing from 239,000 to 896,000. Between 1957 and 1966, employment declined by approximately one-sixth. Supporting the overall expansion of employment, production in the aircraft and parts industry increased about 3½ times, a much faster rate of growth than that for all manu-

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[66] This industry includes establishments primarily engaged in manufacturing or assembling complete aircraft; aircraft engines and engine parts; aircraft propellers and propeller parts; and aircraft parts and auxiliary equipment, not elsewhere classified.

Table 26. Distribution of Wage and Salary Workers in the Aircraft and Parts Industry Group, by Industry, 1966

(In thousands)

SIC Code	Industry	Wage and salary workers		Production workers as percent of employment, by industry	Women workers as percent of employment, by industry
		Number	Percent distribution		
372	Aircraft and parts, total	750.5	100.0	59.3	14.2
3721	Aircraft	417.3	55.6	57.5	14.7
3722	Aircraft engines and engine parts	208.1	27.7	57.4	13.2
3723, 9	Other aircraft parts and equipment	125.1	16.7	68.3	14.2

Note: Individual items may not add to totals because of rounding.

facturing production between 1947 and 1958. From 1958 to 1966, however, production in this industry has increased at about the same rate as that experienced for total manufacturing.

The downward trend in employment between 1958 and 1965 resulted primarily from the decline in production of military aircraft for the Federal Government, which has purchased about four-fifths of the industry's output in recent years. During this period (1958-65), the Government's greater emphasis on the development and production of missiles and spacecraft has resulted in some gain in demand for components produced by this industry.

Since 1965, employment in the aircraft and parts industry has increased sharply to over 800,000 workers. A recent Bureau of Labor Statistics study indicated that most of this increase resulted from military orders directly attributable to the Viet Nam buildup.[67]

Production workers decreased as a proportion of total employment in the aircraft industry, from 74 percent in 1947 to 59 percent in 1966. The rate of decline in the proportion of production workers has been about the same in the individual industries within the industry group.

Manpower requirements in the aircraft and parts industry group are expected to decline to about 585,000 by 1975. (See volume IV, appendix B.) This projection assumes that the trends and patterns of military expenditure will return to that experienced prior to the Viet Nam buildup and that continuing large expenditures will be made on space research and developments. A significant variation from these assumptions would affect employment accordingly.

Occupational Structure

Years of research and development at a cost of many millions of dollars are often required to produce a safe and marketable aircraft. The complex and technical nature of aircraft and aerospace development work is reflected in the industry's very high percentage of professional and technical workers—over one out of five in 1960—a ratio higher than any other durable goods manufacturing industry. (See volume IV, appendix G.) Over one-tenth of the work force[68] in the aircraft industry were engineers, a majority of whom were aeronautical engineers. Most engineers were employed in research and development work, although significant numbers were in production planning, quality control, tool designing, and technical sales. Technicians accounted for almost 5 percent of the work force. Most of these highly trained workers assisted engineers and scientists in research, development, and prototype prooduction operations.

In 1960, operatives were the largest blue-collar occupational group, accounting for over one-fourth of industry employment. Assemblers, the largest semiskilled occupation, were required for such jobs as joining subassemblies and installation of engines and auxiliary equipment such as fuel systems and flight controls. Inspectors and machine tool operators also made up an important share of the work force. Skilled workers accounted for another fourth of employment in the aircraft and parts industry in 1960. A significant proportion of airplane mechanics and repairmen were employed in the industry, both to produce new aircraft and to modify and overhaul existing aircraft. Sheet metal workers also were widely needed in the assembly and modification process. The proportion of clerical workers in the industry—over 17 percent—was considerably higher than the 12 percent average for all durable goods manufacturing.

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[67] "The Employment Effects of Defense Expenditures", *Monthly Labor Review*, September 1967, pages 9-16.

[68] Including self-employed and unpaid family workers, as well as wage and salary workers.

Although substantial changes in technology are expected in the aircraft industry in coming years, the industry's occupational structure is expected to change only moderately by 1975. The most significant metalworking development in the industry over the next 10 years will be the more extensive use of numerical controlled machining (N/C). Laborsaving tape-controlled tools are particularly important in short production runs of intricate shapes common in prototype development of aircraft and space vehicles. In 1962, aerospace firms were using more than 400 numerically controlled tools. About 1,600 are expected to be in use by 1970. Additional operations, such as drafting, welding, and inspection are being adapted to numerical control. Estimates in the reduction of unit labor requirements possible in machining operations through the use of this technique reportedly range from 20 to 80 percent.

Relative to total output, the aircraft and parts industry's research and development budget is expected to continue to rise over the decade ahead, thus creating considerably higher ratios of professional and technical workers. Expansion of the space program and increased research and testing of manned spacecraft, such as supersonic and hypersonic transports, are among developments likely to raise the ratio of engineers in particular. The computer is expected to create additional jobs for systems analysts and programing personnel. Draftsmen will be adversely affected by the spreading use of electromechanical drafting devices. The trend away from high production runs of identical aircraft and the increasing emphasis on research and development should result in a decline in the relative position of both operatives and craftsmen. The ratios of machinists and machine tool operators are expected to be reduced as computer programing of numerical control tools is used increasingly. The proportions of foremen and electricians are expected to increase. These workers will be needed to service a rapidly rising number of complex machines and instruments and to supervise the output of more custom and diversified products. The ratio of machinists is expected to fall significantly because of the broadening applications of numerical control to the operation of machine tools.

A slightly higher proportion of managers and officials will be needed to oversee the expanding number of activities, especially R&D projects, undertaken in this industry. The proportion of clerical workers will decline somewhat as the growing use of electronic data processing equipment reduces manpower requirements in many routine repetitive office jobs.

Instruments and Related Products[69]

Current Employment

About 433,000 wage and salary workers were employed in the instruments and related products major industry group in 1966. (See table 27.) More than one-half were employed in establishments producing scientific and related instruments, including engineering and scientific instruments; mechanical measuring and control devices; and opthalmic goods.[70] Over one-fifth were employed in establishments making photographic equipment and supplies. The remaining workers were employed in establishments making surgical, medical, and dental equipment; optical goods; and watches and clocks.

Production workers accounted for almost two-thirds of total employment in this major industry group in 1966, compared with nearly three-fourths for all manufacturing. Among the individual industry groups, the proportion of production workers ranged from about one-half in engineering and scientific instruments to about four-fifths in establishments making watches and clocks.

Women workers accounted for 35 percent of total employment in the instruments and related products major industry group in 1966, somewhat higher than the 27 percent for all manufacturing. Among the individual industry groups, the proportion of women workers ranged from 24 percent in establishments producing engineering and scientific instruments to 60 percent in establishments manufacturing watches and clocks.

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[69] SIC 38. This major industry group includes establishments engaged in manufacturing mechanical measuring, engineering, laboratory, and scientific research instruments; optical instruments and lenses; surgical, medical, and dental instruments, equipment and supplies; and watches and clocks. Establishments primarily engaged in manufacturing instruments for industry, measuring and recording electrical quantities and characteristics are classified in SIC 3611.

[70] Electrical instruments are classified in the electrical machinery major industry group (SIC 36).

Table 27. Distribution of Wage and Salary Workers in the Instruments and Related Products Major Industry Group, by Industry, 1966

(In thousands)

SIC Code	Industry	Wage and salary workers: Number	Wage and salary workers: Percent distribution	Production workers as percent of employment, by industry	Women workers as percent of employment, by industry
38	Instruments and related products	433.1	100.0	63.9	35.4
381	Engineering and scientific instruments	80.1	18.5	52.1	24.1
382	Mechanical measuring and control devices	108.5	25.1	65.4	34.6
3821	Mechanical measuring devices	67.3	15.5	62.6	29.7
3822	Automatic temperature controls	41.3	9.5	70.0	42.4
383	Optical instruments and lenses	1/16.9	2/4.0	(3)	(3)
384	Surgical, medical, and dental equipment	61.6	14.2	69.3	48.2
385	Ophthalmic goods	31.6	7.3	76.6	44.0
386	Photographic equipment and supplies	96.8	22.4	57.7	26.5
387	Watches and clocks	37.0	8.5	81.6	60.0

1/ Benchmark data for March 1966.
2/ Based on March 1966, total employment in the major industry group.
3/ Data are not available.

Note: Individual items may not add to totals because of the inclusion of benchmark data and/or rounding.

Employment Trends and Outlook

Employment in the instruments and related products major industry group increased from 267,000 to 433,000 between 1947 and 1966, or by 62 percent. This expansion was almost three times as fast as the rate of growth in total manufacturing employment in the post-World War II period. During the same period, production rose by 229 percent in this major industry group, compared with a rise of about 139 percent for all manufacturing.

Between 1958 and 1966,[71] employment growth among the individual industry groups varied greatly, reflecting differences in the growth of product demand and in the rate of introduction of laborsaving innovations. Employment increased fastest (over one-half) in establishments manufacturing optical goods because many industries–including aerospace, chemical, and food manufacturing–increased their use of optical instruments to improve both manufacturing methods and quality control.

Employment in establishments manufacturing photographic equipment; surgical, medical, and dental instruments; ophthalmic goods; and watches and clocks also rose rapidly between 1958 and 1966, despite the increased application of such laborsaving equipment as automatic transfer machines and electronic testing devices. Employment in establishments producing photographic equipment rose over two-fifths, reflecting the growth of the population, rising levels of disposable personal income, increased leisure time, and expanding exports. The number of workers in establishments manufacturing surgical, medical, and dental instruments increased by two-fifths. These employment gains can be traced primarily to greater demand for medical and dental care due to an expanding population, changes in the age composition of the public (more older people), increased health consciousness, and the extension of prepayment plans for medical care and hospitalization. Employment rose by one-fifth in establishments manufacturing ophthalmic goods, reflecting increases in the size, literacy, and educational level of the population; the rising number of older persons; and the increasing emphasis on good vision. The number of workers in establishments producing watches and clocks rose over two-fifths, primarily reflecting increases in population and family income.

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[71] BLS employment (payroll) data for all industry groups are not available for years prior to 1958.

The number of workers in establishments manufacturing engineering and scientific instruments rose 24 percent, and employment in establishments producing measuring, controlling, and indicating instruments increased by 25 percent. Demand for these products is especially sensitive to spending for capital investment and research and development, both of which accelerated rapidly during the 1958-66 period. The introduction of laborsaving innovations, such as numerically controlled machine tools, however, was a significant factor in limiting employment in these industry groups.

Production workers decreased as a proportion of total employment in this major industry group, from 80 percent in 1947 to 64 percent in 1966. During the recent 1958-66 period, however, the proportion declined only slightly. The decreasing production worker ratio resulted from the rising mechanization of production operations.

Manpower requirements in the instruments and allied products industry group are expected to increase by nearly one-fifth between 1966 and 1975, rising from 433,000 to 510,000. (See volume IV, appendix B.) Output is expected to be stimulated by the rapid increase in demand for instruments and allied products by manufacturing and utility industries. However, the growth of labor requirements will be limited somewhat by the greater application of laborsaving technological innovations.

Employment trends for the individual industries within the major industry group are expected to differ only slightly because of differences in demand. Worker requirements are expected to increase rapidly in those industry groups that manufacture scientific and related instruments because of increased capital spending for modernization of industrial production processes and rising expenditures for research and development. Research and development activity is expected to lead to the development of many new instruments and the refinement of those now in use. Expanding activity in fields such as air purification, including environmental control, vehicle exhaust control, and better methods of weather forecasting also will increase the demand for scientific instruments and related products.

Employment growth in the surgical, medical, and dental instruments and supplies section, as well as in the ophthalmic goods section, will stem from the rising demand for health services by an expanding population, the growing number of persons 55 years old and over, the extension of prepayment plans for medical care and hospitalization, and higher levels of personal disposable income.

Employment in establishments producing watches, clocks, and photographic equipment also are expected to increase as the growing population and rising income levels spur demand for these products.

Occupational Structure

The instruments industry is composed of large numbers of small establishments, many producing highly complex and custom-designed devices such as infrared sensing instruments and ultraviolet detecting and analytical apparatus. Large numbers of professional and technical workers—particularly engineers and technicians—are required for research and development activities; in 1960, these workers accounted for one-eighth of the industry's work force.[72] (See volume IV, appendix G.) Substantial numbers of clerical workers also were employed in the industry, many as support personnel for the large professional staff. Product diversity and complexity, coupled with a fast-moving pace of technological change that hastens product obsolescence, tends to restrict the application of automatic production methods in this industry. Accordingly, assembly, balancing, calibration, and inspection are important aspects of the work performed in this industry. Nearly one-third of the workers in the instruments group were concerned with these or other such operative activities. The high degree of accuracy required in the production process is reflected by the substantial concentration of foremen in the skilled occupational group. Mechanics and repairmen, and opticians and lens grinders also were widely utilized to maintain and repair equipment and to satisfy the mounting research and development activities occurring in the field of optics.

The occupational structure in the watches and clocks industry sector differed markedly from the overall industry averages, in part, because of considerably lower research and development activities. In this industry sector, blue-collar workers, particularly operatives, accounted for 7 out of 10 workers while professional and technical workers represented less than 5 percent.

Because of the custom nature and limited volume of many of the systems developed in the instrument and related products industry, technological innovations are expected to exert only a moderate influence on the industry's occupational structure during the decade ahead. Still, the industry's occupational structure seems likely to undergo some significant changes through the mid-1970's. The most significant changes are expected among professional and technical workers. Their relative importance should rise considerably, primarily because of increasing requirements for engineers and technicians in research and development activities associated with an anticipated burgeoning demand for scientific and related instruments. Increasing use of numerically controlled machine tools, particularly in the production of scientific and engineering instruments, also is expected to increase labor requirements for engineers, technicians, machine repairmen, and other personnel skilled in operation and maintenance of electronic data processing equipment.

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[72] Includes self-employed and unpaid family workers, as well as wage and salary workers. The occupational patterns data for the instruments and allied products major industry group includes employment in the sighting and fire control equipment industry group (SIC 194).

On the other hand, at least some of the relatively moderate decline expected in the proportion of some operatives and skilled trades can be attributed to the growing use of numerically controlled machine tools. This technique, which utilizes coded instructions on punched cards to control the sequence of machining operations, can lower scrap and inventories, shorten lead time in production, and permit volume duplication. Workers likely to be adversely affected by increasing use of this technique include machine tool operators, some assemblers, inspectors, machinists, and tool and die makers. More widespread use of transfer machines—multistation machines that automatically load and unload the work piece at each station and move it from station to station—alos will reduce requirements for machine tool operatives, as well as materials handling laborers.

More widespread use of computers will contribute toward the slight decline anticipated in the relative position of clerical workers. In this occupational group, growing manpower requirements for office machine operators will be more than offset by decreasing needs for hand bookkeepers, shipping and receiving clerks, and other clerical workers performing routine jobs that can be more economically handled by a computer.

Two sectors of the instruments and allied products major industry group are expected to exhibit some differences during the decade ahead in the rates of change in their occupational structure. For example, in the watches and clocks industry group, the need for skilled craftsmen, such as tool and die makers and mechanics and repairmen will increase because of the growing use of more complex fabricating and testing equipment and the need for greater precision tooling in the manufacture of watches. In contrast, the relative position of craftsmen should decline slightly in the instruments industry sector.

Miscellaneous Manufacturing Industries[73]

Current Employment

More than 435,000 wage and salary workers were employed in the miscellaneous manufacturing industries major industry group in 1966. (See table 28.) About two-thirds of employment was concentrated in five industry groups: toys, amusements, sporting and athletic goods (27 percent); costume jewelry, buttons, and notions (14 percent); jewelry, silverware, and plated ware (11 percent); pens, pencils, other office and artists' materials (8 percent); and musical instruments (6 percent). The remaining workers were employed in plants manufacturing miscellaneous products, including brooms, linoleum, matches, candles, lamp shades, morticians' goods, furs, signs and advertising displays, and umbrellas.

Production workers accounted for 80 percent of total employment in this major industry group in 1966, somewhat higher than the 74 percent for all manufacturing employment. Individual industries within this major industry group had similar proportions of production workers except for the pens, pencils, and other office and artists' materials industry where the ratio was somewhat lower.

Women workers accounted for 44 percent of total employment in this major industry group, substantially higher than the 27 percent for all manufacturing. Among the individual industry groups, the proportion of women workers ranged from 28 percent in establishments

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[73] SIC 39. This major group includes establishments primarily engaged in products not classified in any other manufacturing major group. Included are industries manufacturing jewelry, silverware, and plated ware; musical instruments; toys, sporting, and athletic goods; pens, pencils, and other office and artists' materials; the manufacture of buttons, costume novelties, and miscellaneous notions; and "other" miscellaneous manufactured products such as brooms and brushes and morticians' goods.

Table 28. Distribution of Wage and Salary Workers in the Miscellaneous Manufacturing Industries Major Industry Group, by Industry, 1966

(In thousands)

SIC Code	Industry	Wage and salary workers		Production workers as percent of employment, by industry	Women workers as percent of employment, by industry
		Number	Percent distribution		
39	Miscellaneous manufacturing industries	434.5	100.0	80.0	44.0
391	Jewelry, silverware, and plated ware	49.2	11.3	78.0	38.8
3911-3	Jewelry, and cutting and polishing precious stones	1/34.4	2/8.2	(3)	(3)
3914	Silverware and plated ware	1/14.3	2/3.4	(3)	(3)
393	Musical instruments and parts	27.2	6.3	83.0	28.3
394	Toys, amusement, and sporting goods	117.9	27.1	83.3	53.4
3941-3	Toys, games, dolls and play vehicles	73.4	16.9	84.1	58.9
3949	Sporting and athletic goods, not elsewhere classified	44.4	10.2	82.2	44.6
395	Pens, pencils, office and art materials	34.6	8.0	73.4	52.0
396	Costume jewelry, buttons and notions	58.9	13.6	82.5	55.2
398, 9	Other miscellaneous manufacturing industries	1/144.1	2/34.6	(3)	(3)

1/ Benchmark data for March 1966.
2/ Based on March 1966, total employment.
3/ Data are not available.

Note: Individual items may not add to totals because of the inclusion of benchmark data and/or rounding.

producing musical instruments and parts to 55 percent in establishments producing costume jewelry, buttons, and notions.

Employment Trends and Outlook

Employment in the miscellaneous manufacturing industries major industry group declined by more than 11 percent between 1947 and 1958, falling from 421,000 to 373,000. Since 1958, however, this downward trend has been reversed, and by 1966, employment had rose by 16 percent. Over the entire 1947-66 period, however, employment increased only 3 percent, compared to the 23 percent increase in all manufacturing employment. Production in the major industry group rose by 99 percent between 1947 and 1966, considerably slower than all manufacturing production.

Between 1958 and 1966,[74] employment increased in all industry groups within this major industry group. The most rapid increases in employment occurred in establishments producing musical instruments and parts; and toys, amusements, and sporting goods. Demand for these products, as well as most items produced by other miscellaneous manufacturing industries, was stimulated by an increasing population, particularly in the number of young people; rising personal disposable income; and increased leisure time.

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[74] BLS employment (payroll) data are not available for all industry groups for the years prior to 1958.

Production workers decreased as a proportion of total employment in this major industry group, from 87 percent in 1947 to 80 percent in 1966. Most of this decrease occur during the 1947-58 period. Since 1958, the proportion of production workers to total employment in each of the industry groups remained relatively stable.

Employment requirements in this major industry group are expected to increase from 435,000 in 1966 to approximately 475,000 in 1975, or by about 10 percent. (See volume IV, appendix B.) The number of new family formations is expected to rise significantly beginning in the late 1960's and will spur demand for such items as household accessories and toys. Technological change is expected to have little effect on employment growth in this major industry group. In general, the establishments in this industry are relatively small in size, and some of the products, such as precious and costume jewelry, are largely handmade and produced in relatively limited quantities.

Within the miscellaneous manufacturing industries major industry group, increases in labor requirements are expected to occur in establishments producing toys, amusements, and sporting goods; musical instruments; pens, pencils, office and art materials; and "other" manufactured products, combined. Employment requirements in both jewelry, silverware, and plated ware and in costume jewelry, buttons, and notions are expected to decline.

Occupational Structure

About half of all workers[75] in the miscellaneous manufacturing major industry group in 1960 were operatives (see volume IV, appendix G), the vast majority of whom were in the residual "other" operative classification. Workers in this occupation have such heterogeneous job titles as bowling pin refinisher, bobby-pin maker, toy stuffer, button breaker, and brush cutter. The diversity of the products manufactured and the considerable importance of assembly operations on small and frequently delicate products accounted in large measure for the significant number of these workers. Assemblers accounted for the most common operative occupation. Though small in proportion relative to some other durable goods industries, craftsmen and foremen represented the second largest occupational group in this industry, accounting for nearly one-sixth of total employment. Foremen made up about one out of four workers in the skilled occupational group. The high manpower requirements for these workers reflects the limited skill required in many of the production processes and the large concentration of operatives in this industry.

Clerical workers (13 percent) accounted for nearly one-half of the white-collar workers, while managers, officials, and proprietors (9 percent) made up most of the remainder. The high proportion of managers results primarily from the small establishment size that is a characteristic of this industry.

Technological innovations are not expected to affect the occupational structure of this industry significantly over the coming decade. In general, establishments in this industry are relatively small in size and some of the products, like precious and costume jewelry, are largely handmade and produced in relatively limited quantities. In the manufacture of precious jewelry, for example, little technological change has occurred and hand craftsmanship is still essential to jewelry manufacturing. Although the manufacture of costume jewelry is becoming more mechanized, hand assembly and finishing operations will continue to be necessary. However, in some production operations, improvements in industrial machinery are being introduced. For example, in the casting process, continued improvements in the operating speed, capacity, and instrumentation of equipment have occurred, resulting in faster production of better quality casting. In toy manufacturing, increasing use will be made of automatic assembly machines, plastic blow molding, and spray painting techniques. These technological developments are expected to result in a slight reduction in the proportion of operatives such as assemblers and inspectors, while increasing the relative proportion of foremen. On the other hand, welders and flame cutters are expected to increase slightly, due to the anticipated rise in the production of musical instruments and parts. Among professional workers, the relative position of designers should improve as design of jewelry, games, and toys becomes increasingly important. Few changes are expected in most other occupational categories.

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[75] Including self-employed and unpaid family workers, as well as wage and salary workers.

TRANSPORTATION AND PUBLIC UTILITIES[76]

Current Employment

Nearly 4.2 million wage and salary workers were employed in the transportation and public utilities industry division in 1966. (See table 29.) Almost half of total transportation and public utility employment was concentrated in two major industry groups–motor freight, which accounted for nearly one-fourth of employment; and communications, which represented more than one-fifth. Railroads accounted for slightly over one-sixth of total employment in this division, and electric, gas, and sanitary services represented about 15 percent. Other major industry groups employing smaller proportions include: local and interurban passenger transit; water transportation; air transportation; pipeline transportation; and transportation services such as freight forwarding and stockyards.

Manpower requirements in the transportation and public utilities industry division are expected to increase moderately through the mid-1970's. The number of workers employed in this industry division may reach 4.6 million by 1975, 10 percent higher than the 4.2 million workers employed in 1966. (See volume IV, appendix B.) Technological developments which could adversely affect manpower requirements in this division involve higher capacity equipment, such as larger truck tractors and higher capacity electric generating equipment. In addition, data processing equipment coupled with improved communications facilities will play an increasingly important role in advance planning and administrative decisionmaking, as well as in improving office operations.

Manpower requirements in the transportation industries are expected to increase slightly faster than the labor requirements for the division as a whole. Despite the high level of activity projected for the telephone and broadcasting segments of the communications industry, manpower requirements in the communications industry are expected to be about the same in 1975 as in 1966. Also, little or no change is anticipated in manpower requirements for electric, gas, and sanitary services, even though output in all sectors of this major industry group is expected to continue to increase rapidly as a result of population and business expansion. These rapid increases in output, however, are expected to be approximately offset by gains in output per worker.

Employment Trends and Outlook

Employment in the transportation and public utilities industry division remained constant at 4.2 million between 1947 and 1966.

Employment trends varied widely among the major industry groups. Rapid employment growth occurred only in motor freight and air transportation. Between 1947 and 1966, motor freight employment grew by more than four-fifths; over the 1958-66 period, employment in this industry increased by nearly one-third. During this latter period,[77] employment in air transportation increased by nearly one-half. The only other major industry groups to experience overall employment growth were water transportation and transportation services, combined; communications; and electric, gas, and sanitary services, which increased rapidly until the late 1950's but leveled off between 1957 and 1966.

Employment in the remaining industry sectors declined over the years for which employment data are available. The most rapid employment declines occurred in railroad and pipeline transportation. Railroad employment in 1966 was less than half of that recorded for 1947. Between 1958 and 1966, both railroad and pipeline employment dropped by more than one-fourth, and employment in local and interurban passenger transit declined by 6 percent.

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[76] SIC Division E. This division includes enterprises engaged in passenger and freight transportation by rail, highway, water, or air, or furnishing services related to transportation; petroleum pipeline transportation; warehousing; telephone and telegraph communication services; radio broadcasting and television; and the supplying of electricity, gas, steam, water, or sanitary services. Industries assigned to this division are, to a large extent, regarded legally as having a semipublic character. Most of the establishments included are regulated by commissions or other public authorities as to the rates or prices they may charge, and the services they may render. The workers and physical facilities of an enterprise classifiable in this division are often distributed over an extensive geographic area.

[77] BLS employment (payroll) data are not available for 6 of the 9 major industry groups in this industry division for the years prior to 1958.

Table 29. Distribution of Wage and Salary Workers in the Transportation and Public Utilities Division by Major Industry Group, 1966

(In thousands)

SIC Code	Industry	Wage and salary workers		Non-supervisory workers as percent of employment, by industry	Women workers as percent of employment, by industry
		Number	Percent distribution		
E	Transportation and public utilities	4,151.0	100.0	(3)	18.9
40	Railroad transportation	718.5	17.3	(3)	(3)
41	Local and interurban transit	268.7	6.5	(3)	7.9
42	Motor freight transportation	1,007.5	24.3	91.2	8.1
44	Water transportation	1/231.0	2/5.7	(3)	(3)
45	Air transportation	246.9	5.9	(3)	23.6
46	Pipeline transportation	18.8	0.5	84.0	8.0
47	Transportation services	1/ 90.3	2.2	(3)	(3)
48	Communications	927.0	22.3	79.0	49.8
49	Electric, gas, and sanitary services	628.2	15.1	86.7	15.0

1/ Benchmark data for March 1966.
2/ Based on March 1966, total employment in the industry division.
3/ Data are not available.

Note: Individual items may not add to totals because of the inclusion of benchmark data and/or rounding.

Railroad Transportation[78]

Current Employment

Approximately 719,000 wage and salary workers were employed in the railroad transportation major industry group in 1966. (See table 30.) Nearly 9 out of 10 workers were employed by Class I line-haul railroads. The remaining workers were distributed between Class II railroads and services allied to rail transportation, such as sleeping and dining car services, railway express, and switching and terminal companies.

Employment Trends and Outlook

Employment in railroad transportation declined from 1.6 million in 1947 to 719,000 in 1966, a reduction of over one-half. Employment in class I line-haul railroads and in the remaining industry groups, combined, declined at approximately the same rate as the major industry group.

The decrease in railroad employment during this period is attributable to a rapid decline in passenger traffic and advancements in laborsaving technology. Railroad passenger miles dropped steadily from 46.8 billion in 1947 to 17.5 billion in 1965, a decline of over 60 percent. Although rail ton-milage was slightly higher in 1965 (700 billion) than in 1947 (665 billion), the increased freight activity was not a major influence on the long-run decline of railroad employment. Technological changes contributing to the decline of railroad employment included the transition to diesel locomotives, which have less maintenance requirements and can haul larger and heavier trains than could steam locomotives; the expanding use of mechanical equipment to maintain roadways; the application of automatic control to freight classification activities; a reduction in rail tracks through the use of centralized traffic control systems and the elimination of some track lines; and the increasing application of electronic data processing systems to accounting and recordkeeping activities.

Manpower requirements in railroad transportation are expected to continue to decline through the remainder

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[78] SIC 40. This major group includes companies furnishing transportation by line-haul railroad, and certain services allied to rail transportation such as sleeping and dining car services, railway express, and switching and terminal companies.

Table 30. Distribution of Wage and Salary Workers in the Railroad Transportation Major Industry Group, 1966 1/

(In thousands)

SIC Code	Industry	Wage and salary workers	
		Number	Percent distribution
40	Railroad transportation	718.5	100.0
4011-1	Class I railroads	624.9	87.0
4011-2	Class II railroads	1/15.9	2/2.2
4013-1	Class I switching and terminal companies	1/24.6	2/3.5
4013-2	Class II switching and terminal companies	1/16.6	2/2.3

1/ Benchmark data March 1966.
2/ Based on March 1966, total employment in the major industry group.

Note: Individual items may not add to totals because data for all industries in the major industry group are not available, and because of the inclusion of benchmark data and/or rounding.

of the 1960's. By the early 1970's, however, the employment trend is expected to reverse, and labor requirements should reach 810,000 by 1975, an overall increase of about 13 percent between 1966 to 1975. (See volume IV, appendix B.) This employment increase is expected to stem from a more pronounced upward trend in freight traffic due to anticipated high levels of economic activity and the likelihood that improved technology will enlarge the industry's share of all freight traffic through reduced unit costs. However, should this acceleration of output growth fail to occur, and should current trends in output and productivity continue, employment is likely to be approximately 600,000 in 1975.

Technological innovations are expected to limit the growth of employment requirements in this major industry group. For example, savings in maintenance and operating labor will be derived as older diesel electric locomotives are replaced by relatively fewer more powerful diesel electrics pulling heavier loads at greater speeds. Improved electronic equipment and automatic control systems will improve operating efficiency and permit traffic to grow without proportionate increases in employment. "Piggyback" service will continue to gain favor with shippers over the coming decade. This trailer-on-flatcar transportation system lowers unit labor requirements significantly.

Continuation of the present trend towards railway mergers–particularly mergers between roads having parallel lines–also could reduce employment opportunities for railroad workers. However, since freight traffic is increasing, consolidated railroads may delay reductions in duplicate roadways, trackage, and signal facilities until new traffic patterns are determined.

Occupational Structure

In 1964, the railroad industry rolled some 30,000 locomotives and several million freight cars over the Nation's 200,000 miles of rail lines. Large numbers of blue-collar workers–about 6 out of 10 workers[79] in the industry in 1960–were engaged in operating and maintaining this vast network. Craftsmen, foremen, and kindred workers constituted the largest occupational group in the industry in 1960, accounting for half of the blue-collar workers and nearly one-third of total railroad employment. (See volume IV, appendix G.) The craftsmen group was primarily composed of foremen, two groups of skilled operating personnel (locomotive engineers and firemen), and three groups of maintenance workers (mechanics and repairmen, mechinists, and inspectors). Most maintenance workers were employed in railroad yards, carshops, and engine houses, where they maintained, inspected, and repaired locomotives, cars, and other rolling stock. Locomotive firemen (helper) assisted engineers by looking for track obstructions and by checking and adjusting equipment. About one-fifth of all railroad workers were operatives, more than half of whom were brakemen or switchmen. Brakemen (sometimes referred to as trainmen or flagmen) are members of the train crew and directs the placement and pick up of cars at industry sites and make numerous safety inspections of the train and its braking system. Switchmen (also referred to as yard brakemen or helpers) are yard workers who assist in coupling and uncoupling cars and in controlling the yard movement of

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[79] Including self-employed family workers, as well as wage and salary workers.

cars. Most of the remaining workers in the operative segment were grouped in the residual classification. Among workers in this category were oilers and greasers, stationary firemen, towermen, and platform truckers. Constituting more than 1 out of 10 workers in the industry, laborers were employed in significant numbers to maintain roadbeds and rails, and as helpers in repair shops.

White-collar workers accounted for nearly one-third of railroad employment in 1960. A majority of white-collar workers were in the clerical occupational group, mostly in the "other" clerical and kindred workers segment. Ticket agent, railway express agent, baggageman, and railway mail clerk are common occupations found in the "other" segment. Employment in the managers, officials, and proprietors group was about equally divided between conductors and other managers and officials. Utilized on both passenger and freight trains, conductors are "captains" of their trains and are responsible for all onboard activities. Yard conductors (often called yard foremen) direct the work of switching crews and, in mechanized yards, operate consoles that electrically control the alinement of track switches. Many of the service workers provide personal services to passengers at stations and aboard trains. Included were Pullman conductors who supervise sleeping and parlor car service on most trains, as well as porters and attendants, cooks, waiters, and redcaps. In 1960, the ratio of professional, technical, and kindred workers was less than 3 percent.

The effects of both improving technology and increasing freight traffic are expected to be reflected in a railroad work force in 1975 having higher percentages of workers in the professional and operatives occupational groups and relatively fewer workers in the laborers, service workers, and certain craftsmen occupations. Because of increasing emphasis on new and improved mechanical and electrical freight handling systems, the railroad industry is expected to employ a larger proportion of workers in most of the professional, technical, and kindred occupations. Many technically trained workers–particularly methods analysts and industrial engineers–will be needed to develop and establish new procedures for handling freight, as well as improve the utilization of existing facilities. Other engineers will be assigned research and development activities in areas such as roadbed stabilization, automatic prevention and detection of equipment malfunctioning, packaging improvement, and "piggyback" refinement. Developmental programs in high speed ground transportation systems also will increase the need for technically trained personnel. As railroads continue to explore new ways to meet competition, specialists in industrial development and marketing will be used more widely. The ever widening horizon of the computer will be reflected in larger concentrations of programers and other electronics specialists.

The proportion of operatives should increase, primarily because of the growth in the number of brakemen. Unlike most nonoperating employees, brakemen and other operating personnel (except firemen) will increase in nearly direct relation to the expansion in traffic that is expected over the next 10 years. Anticipated growth in railway express and piggyback services will be reflected in greater needs for truck and tractor drivers associated with these activities. On the other hand, yard brakemen will be adversely affected by the trend toward automatic classification yards. An increase in the ratio of conductors–another operating group–is the prime factor behind the rising share of employment expected in the managers, officials, and proprietors occupational group.

Expanding use of the computer and other new office equipment, together with a growing volume of business, should contribute to improving somewhat the relative position of clerical workers such as office machine operators. On the other hand, the trend toward railway mergers and automated accounting and recordkeeping activities is likely to consolidate clerical operations and result in a slight decline in the relative position of accounting clerks and other clerical workers performing routine repetitive tasks.

The proportion of workers in the craftsmen, foremen, and kindred workers occupational group is expected to decline somewhat by 1975, although the absolute number of most occupations in the group will increase. This apparent contradiction is explained by the unusually sharp decline anticipated in one important occupation in 1960–locomotive firemen. Under terms of a 1964 arbitration award, railroads operating in states without "full-crew" laws were given the right to eliminate eventually most locomotive firemen's jobs in road freight and yard locomotive service. Foremen, machinists, locomotive engineers, and railroad and car shop mechanics should each increase in relative importance as the number, size, and complexity of rolling stock increases in response to rises in freight activity. The proportions of electricians and instrument repairmen also will gain as electronically operated controls, such as those used in automatic car identification systems and micro-wave communications, are extensively used.

Roadway maintenance machines will continue to displace laborers who once performed these tasks using hand or pneumatically powered tools. However, more efficient "second generation" machines such as those capable of raising and lining a track and leveling and tamping the roadbed in a single operation, will contribute to a further reduction in the needs for laborers by 1975. Greater use of materials handling equipment for bulk loading and stores movement also will be an important factor in the relative decline of laborers. The downward drift in long distance coach and pullman passenger service will adversely affect the majority of service worker occupations. However, policemen will increase slightly relative to total employment as rising freight activity generates additional protection requirements.

Local and Suburban Transit and Interurban Passenger Transportation[80]

Current Employment

Approximately 269,000 wage and salary workers were employed in the local and suburban transit and interurban passenger transportation major industry group in 1966.[81] (See table 31.) About 9 out of 10 workers were concentrated in three principal industry groups–taxicabs (41 percent), local and suburban transit (31 percent), and intercity and rural buslines (16 percent). Employment of the remaining workers was distributed among charter services, school buses, and terminal and service facilities.

Nonsupervisory workers accounted for more than 9 out of 10 workers in both local and suburban transportation and intercity and rural buslines.

About 8 percent of the workers in the major industry group in 1966 were women. Among the individual industry groups, the proportion of women workers ranged from 4 percent in taxicab establishments to 11 percent in intercity and rural busline establishments.

Employment Trends and Outlook

Employment in the local and interurban passenger transportation major industry group declined from 285,000 in 1958[82] to 269,000 in 1966, or by approximately 6 percent. Between 1947 and 1966, employment in local and suburban transit declined by nearly three-fifths. A slower employment decrease of about 10 percent was experienced in the taxicab sector between 1958 and 1966. The reduction in employment in each of these industry groups was principally the result of a growing reliance on private automobile transportation. The demands of suburban living for a highly flexible means of personal transportation, higher levels of consumer incomes, and improved highways all contributed toward wider use of private automobiles, decreasing the need for other types of interurban passenger transportation.

Employment in intercity and rural buslines declined nearly one-fourth between 1947 and 1966. Competition from other modes of transportation, such as private automobiles and air carriers, was largely responsible for this decrease. Although intercity passenger travel has grown dramatically since the post-World War II period, intercity bus travel has declined both relatively and absolutely. However, since 1960, the downward trends in intercity bus traffic and employment appear to have leveled off, largely because of vigorous promotional campaigns by intercity bus companies and improved services to the traveling public.

In contrast to the declining trends in the three principal industry groups, employment in other services allied to highway transportation more than doubled between 1958 and 1966. Most of this increase resulted from the growing demand for school bus transportation.

Little or no change is expected in employment requirements of the local and suburban transit and interurban passenger transportation major industry group between 1966 and 1975. (See volume IV,

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[80] SIC 41. This major group includes companies primarily engaged in furnishing local and suburban passenger transportation, such as companies providing passenger transportation within a single municipality, contiguous municipality, or a municipality and its suburban areas by rail or trolley coach, either separately or in conjunction with motor buslines, and companies engaged in furnishing transportation to local scenic features, including cable and cog railways. Companies furnishing highway passenger terminal or maintenance facilities also are included as are intercity buslines.

[81] BLS employment (payroll) data for the local and suburban transportation industry excludes workers employed by publicly owned transit systems.

[82] BLS employment (payroll) data for the major industry group are not available for years prior to 1958. Available information indicates that employment in publicly and privately owned transit systems combined declined by about 100,000 workers in the post-World War II period.

Table 31. Distribution of Wage and Salary Workers in the Local and Suburban Transit and Interurban Passenger Transportation Major Industry Group, by Industry, 1966

(In thousands)

SIC Code	Industry	Wage and salary workers		Non-supervisory workers as percent of employment, by industry	Women workers as percent of employment, by industry
		Number	Percent distribution		
41	Local and suburban transit and interurban passenger transportation	268.7	100.0	(3)	7.9
411	Local and suburban transportation	82.0	30.5	94.5	5.1
412	Taxicabs	108.7	40.5	(3)	4.4
413	Intercity and rural buslines	41.8	15.6	91.6	10.5
414, 5, 7	Other services allied to highway transportation	1/41.6	2/15.0	(3)	(3)

1/ Benchmark data for March 1966.
2/ Based on March 1966, total employment in the major industry group.
3/ Data are not available.

Note: Individual items may not add to totals because of the inclusion of benchmark data and/or rounding.

appendix B.) Employment growth in these industries will be limited principally by the lack of growth in passenger traffic on privately operated public transportation systems, rather than by increasing use of labor saving innovations.

Little or no change is expected in employment requirements in the local and suburban transportation and the taxicab industry groups between 1966 and 1975. The continuing shifts in population to the suburbs and the increasing use of privately owned automobiles will further reduce passenger traffic. This decrease will be moderated somewhat as downtown traffic congestion and parking problems continue to abet bus and taxi travel in mid-town areas. Privately owned transportation companies[83] also will be adversely affected by a continuation of the present trend toward publicly owned local transit systems. Employment declines also should be moderated by legislation, such as that passed in mid-1964, which offers financial assistance to help urban communities alleviate downtown traffic congestion and parking problems. However, this legislation is unlikely to affect total transit employment significantly in the next decade.

Employment requirements in intercity and rural buslines are expected to increase moderately between 1966 and 1975. Population growth, higher consumer income, and more leisure time will result in an increase in intercity travel. Bus traffic also will be favorably affected by touring and charter services and by bus transport of package-express and first-class mail, an important source of carrier revenue in the past several years. Further curtailment or elimination of railroad passenger service in many areas also may be expected to encourage greater use of intercity bus service.

Occupational Structure

Operatives–nearly all of them drivers–accounted for more than 7 out of 10 workers employed in the local and suburban transit and interurban passenger transportation major industry group in 1960. (See volume IV, appendix G). The proportions of craftsmen (primarily mechanics), service workers, and laborers in the local and suburban transportation sector were much higher than in the taxicab sector. On the other hand, the percentage of operatives and of managers and proprietors to total employment was somewhat higher in the taxicab industry. These differences were related to variances between the two sectors in the average size of establishments. Firms engaged in the taxicab business are often quite small, and many drivers are self-employed owner-operators. Thus, the proportion of operatives and proprietors was high, and the ratio of support personnel, such as mechanical workers and laborers, tended to be low.

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[83] BLS payroll series includes only privately owned transportation companies. Publicly owned systems are included with local government employment.

Technological innovations are expected to have only a moderate effect on the occupational structure of local and interurban passenger transportation industries over the coming decade. Most improvements in technology will center around development of rapid (rail) transit systems in the larger cities and improvements in bus facilities in many small and medium-sized cities. The development and improvement of local transit facilities in both large and small cities are expected to be accelerated by provisions of the recently enacted Federal legislation mentioned earlier.

Technological developments coupled with expected changes in traffic volume will cause a significant shift in the occupational composition of the local and suburban transit and interurban major industry group over the 1965-75 period. The proportion of drivers is expected to increase, mainly because of the expansion of intercity bus operations and the increased use of charter and school bus services. The growing network of new highways will provide the major impetus for increased intercity bus travel. The shorter time schedules made possible by these new highways are expected to make motor buses more competitive with other forms of transportation. In addition, more comfortable buses equipped with washrooms, meal facilities, and air conditioning should make motor bus travel more attractive and reduce the frequency of stops on long trips. In the taxicab industry sector however, the proportion of drivers is expected to remain at about the 1960 level. Increased use of privately owned automobiles, as well as continuing population shifts to the suburbs, will limit the need for drivers in this industry group. This negative influence, however, will be offset womewhat by a continuing scarcity of parking space in inner cities, as well as general traffic congestion, which will stimulate the use of local transit facilities.

A lower proportion of managers and proprietors is anticipated in the taxicab industry sector by 1975. This is expected to result from the continuation of a trend in the industry toward larger firms. This trend also is expected to result in larger proportions of dispatchers, radio operators, motor vehicle mechanics, and clerical workers. On the other hand, technological improvements in motor bus design and construction, improved highways, and advances in tool and maintenance equipment will result in less maintenance downtime and a slightly lower ratio of mechanics and repairmen to total employment in the local, suburban, intercity passenger transportation industry sectors. Technological innovations, such as automatic ticket dispensing machines, office machine copiers, and electronic data processing equipment, will become more prevalent and should result in lower ratios for clerical personnel. The percentage of accounting clerks, for example, is expected to decrease substantially, as computers are used increasingly to handle accounting and payroll operations.

Motor Freight Transportation and Warehousing[84]

Current Employment

Over 1.0 million wage and salary workers were employed in the motor freight transportation and warehousing major industry group in 1966. (See table 32) More than 9 out of 10 workers were employed by local and long distance trucking firms. The remainder were employed in public warehousing establishments.

Nonsupervisory workers accounted for more than 9 out of 10 workers in this major industry group in 1966. Women workers accounted for less than one-tenth of total employment.

Employment Trends and Outlook

Employment in the motor freight transportation and warehousing major industry group increased rapidly in the post-World War II period, from 551,000 workers in 1947 to over 1.0 million in 1966, an increase of about 80 percent.

The growth of trucking employment resulted from a rapid increase in motor carrier freight traffic. Between 1947 and 1965, the number of intercity ton-miles accounted for by all private and for-hire motor carriers increased over 2½ times, compared to an increase of about 60 percent in the number of intercity ton-miles for all carriers of freight (rail, truck, pipeline, water and air). Growth of trucking employment also was stimu-

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[84] SIC 42. This major group includes establishments furnishing local or long distance trucking, transfer, and draying services, or engaged in the storage of farm products, furniture, and other household goods or commercial goods of any nature. The operation of terminal facilities for handling freight, with or without maintenance facilities, is also included. This group does not include delivery departments or warehouses operated by business concerns for their own use.

Table 32. Distribution of Wage and Salary Workers in the Motor Freight Transportation and Warehousing Major Industry Group, by Industry, 1966

(In thousands)

SIC Code	Industry	Wage and salary workers		Nonsupervisory workers as percent of employment, by industry	Women workers as percent of employment, by industry
		Number	Percent distribution		
42	Motor freight transportation and storage	1,007.5	100.0	91.2	8.1
422	Public warehousing	84.5	8.4	87.7	12.7
421, 3	Motor freight transportation 1/	2/888.2	3/91.7	(4)	(4)

1/ Consists of local and long distance trucking as well as terminal maintenance facilities for motor freight transportation.

2/ Benchmark data for March 1966.

3/ Based on March 1966, total employment in the major industry group.

4/ Data are not available.

Note: Individual items may not add to totals because of the inclusion of benchmark data and/or rounding.

lated by the expansion of local freight volume, since trucks carry virtually all freight for local distribution. Local trucking employment also has been favorably affected by the rapid increase in suburban shopping centers and by a shift toward suburban industry relocations.

Manpower requirements in this major industry group are expected to increase by about one-fifth between 1966 and 1975, rising to approximately 1.2 million. (See volume IV, appendix B.) Future employment growth is predicated upon a steadily rising demand for motor freight services. However, increasing use of more efficient freight handling systems and changing competitive conditions will have a limiting affect on this industry's employment growth in the years ahead.

Intercity motor freight traffic is not expected to expand in the future as rapidly as it has in the past. The diversion of high value commodity traffic from rail to truck by means of lower freight rates can no longer be expected to contribute to the expansion of the motor carrier industry. Today, in their effort to retain existing business and recover traffic formerly carried, railroads are placing more emphasis on cost reduction. Motor carriers also are facing increasing competition from air carriers for the movement of high value traffic. In addition, rail, water, and air carriers are establishing or increasing the size of their own trucking fleets, enabling them to provide direct freight services to customers far removed from their facilities.

Motor trucking will continue to be the predominant method of distributing goods within local market areas. Employment in local trucking should grow rapidly in the years ahead in response to the anticipated rapid rise in the total volume of freight moved in the economy.

Occupational Structure

More than half of all workers employed in the motor freight and warehousing major industry group in 1960 were truck and tractor drivers.[85] (See volume IV, appendix G.) However, the occupational structure of the two major sectors of the industry differed considerably. The ratio of operatives in the local and long distance trucking sector was more than 5 times that in the warehousing sector because of the very large numbers of motor freight industry workers who were employed as truck and tractor drivers. Ratios for all occupational groups except operatives were larger in the warehousing sector than in the motor freight group. Laborers and clerical workers represented particularly large proportions of total employment in warehousing, reflecting the greater importance of materials handling and recordkeeping functions in this industry group. The percentages of professional workers and craftsmen in the motor freight transportation and warehousing major industry group were low. Most professional workers were accountants and auditors, while over half of the industry's craftsmen were motor vehicle mechanics.

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[85] Employment data related to self-employed and unpaid family workers, as well as wage and salary workers.

Changing technology during the next 10 years will significantly increase output per worker in nearly all occupational areas of the motor freight transportation and warehousing major industry group. The changing nature of our system of highways and the laws governing their use determine a significant part of the changing technology of the motor freight industry. The vast interstate and defense highway system, which is now over half completed, will continue to increase the efficiency of motor carrier operations by reducing running time and cutting maintenance and accident costs. The completion of this system of divided, limited-access highways and the construction of toll throughways and improvements in other Federal and State roads is expected to result in increased legal size and weight maximums for vehicles.

Over the next decade, technological developments in the motor freight transportation and warehousing major industry group are expected to change the industry's occupational structure somewhat. The proportion of laborers is expected to decline substantially, particularly in the warehousing industry sector. More efficient terminals and warehouses, applying modern materials handling practices, such as containerization, cargo caging, palletizing, conveyorizing, and automatic dragline methods, will significantly contribute toward a decline in the relative requirements of materials handling laborers.

The greatest employment growth in this major industry group is expected to occur among larger firms. Compared with smaller organizations, larger companies have considerably higher proportions of professional workers, clerical workers, mechanics and repairmen, and foremen. These workers are expected to increase their share of total employment as the trend towards larger firms continues. However, the increasing use of standardized freight containers, as well as computers and other office machines, will tend to moderate growth rates in some clerical positions such as shipping and receiving clerk, bookkeeper, and accounting clerk.

Customarily, managers make up a greater proportion of employment in smaller firms, since they often perform many functions that are assigned to other occupational groups in larger organizations. Therefore, a decline in the proportion of managers, officials, and proprietors is expected in the trucking industry as employment becomes more concentrated in larger firms.

Because of divergent employment trends, the relative position of operatives–nearly all of them truck and tractor drivers–is expected to change only slightly over the coming decade. The most significant laborsaving changes will occur in non-driving areas, and this should tend to increase the proportion of drivers. The ratio of truck drivers, especially those engaged in moving home furnishings, should advance substantially in the warehousing industry sector in response to the increasing mobility of American families. These positive influences, however, are likely to be offset somewhat by the continuing growth of large firms, where drivers make up a smaller part of the work force; and by other developments such as the new interstate highway network, and the increasing capacity and performance of trailers and power units which will reduce driving requirements per ton of freight. Among operatives other than truck and tractor drivers, the proportion of meat cutters in warehousing is expected to be adversely affected because of an anticipated continued decline in food locker plants. The ratio of equipment operators should rise as mechanization in the warehousing industry becomes more widespread.

The relatively low ratio of sales workers in this major industry group is expected to rise appreciably over the next decade as competition with other transportation modes intensifies.

Transportation by Air[86]

Current Employment

Of the nearly 247,000 wage and salary workers in the air transportation major industry group in 1966, 9 out of 10 were employed by air common carriers providing for-hire air transportation to the public.(See table 33.) The remaining workers were employed at airport terminals and by operators of airports and flying fields.

One-fourth of the workers employed by air common carriers were women, a slightly higher proportion than the average for the major industry group.

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[86] SIC 45. This major group includes companies engaged in furnishing domestic and foreign transportation by air and also those operating flying fields and furnishing terminal services.

Table 33. Distribution of Wage and Salary Workers in the Transportation by Air Major Industry Group, by Industry, 1966

SIC Code	Industry	Wage and salary workers		Women workers as percent of employment, by industry
		Number	Percent distribution	
45	Air transportation	246.9	100.0	23.6
451, 2	Transportation, common carriers	221.9	89.9	25.3
458	Facilities and services related to air transportation	1/24.1	2/9.8	(3)

1/ Benchmark data for March 1966.
2/ Based on March 1966, total employment in the major industry group.
3/ Data are not available.

Note: Individual items may not add to totals because of the inclusion of benchmark data.

Employment Trends and Outlook

Employment of wage and salary workers in the air transportation major industry group increased from 165,000 in 1958 to nearly 247,000 in 1966, or by almost 50 percent,[87] paralleling the rise in air carrier employment, which rose from about 149,000 to 222,000. The growth in air carrier employment resulted primarily from the very rapid rise in air traffic, particularly among scheduled airlines. However, airlines have been able to expand their activities several times faster than employment, chiefly by utilizing more efficient aircraft and ground operations equipment. In recent years, the airlines have been replacing piston powered aircraft with faster and higher hauling capacity turbine (jet) powered aircraft. On the ground, computers and other electronic and mechanical devices have been used to improve communications, data processing, flight planning, and aircraft and traffic servicing.

Employment in fixed facilities and related services, airports, flying fields, and terminals increased by 44 percent between 1958 and 1966. Employment at airport terminals and in fixed base operations has expanded with the general rise in air traffic. Fixed base employment also has gained, matching the increasing activity in business flying and other segments of general aviation.

Manpower requirements in the air transportation industry are expected to increase from 247,000 in 1966 to 325,000 in 1975, or about 32 percent. (See volume IV, appendix B.) This rapid growth is expected to result from an expanding demand for air transportation services, both passenger and cargo, because of rising consumer and business incomes, an expanding population, and increasing amounts of leisure time.

Technological innovations also will have a significant impact on the growth of air traffic. Equipment improvements, such as better flight control and guidance systems, are expected to make air travel more attractive by increasing safety and dependability. Greater use of more efficient turbine powered aircraft in cargo operations and improvements in cargo handling and loading equipment are expected to stimulate demand for freight traffic by reduced rates and improved service. Future growth in air traffic also is expected to result from the extension of air freight services to many small- and medium-sized communities. Growth in employment requirements will be limited, however, by technological innovations such as the development of longer range and higher capacity jet planes.

Occupational Structure

To fly a commercial plane into the air in 1960, the services of 10 support personnel were required for every pilot and navigator employed in the air transportation major industry group.[88] Nearly 3 out of 10 support personnel were clerical workers, the vast majority of whom were employed in traffic service occupations such as reservation, baggage, ticket, or freight clerk. Reflecting the large number and complexity of today's aircraft and their rigid maintenance requirements, airplane mechanics constituted by far the largest occupation in the industry. A majority of the professional and technical personnel, as well as service workers, were engaged in flight deck activities. Pilots and navigators accounted for nearly two-thirds of all professional and technical workers, while airline stewards and stewardesses accounted for more than half of all service workers. Many of the remaining service workers were employed in occupations such as airplane cabine cleaner, detective, guard, fireman, cook, and waitress.

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[87] BLS employment (payroll) data for the air transportation major industry group and for the fixed facilities and services industry are not available for years prior to 1958.

[88] Employment data in this section cover self-employed and unpaid family workers, as well as wage and salary workers.

The rising demand for air transportation services and the introduction of technological innovations, such as more efficient jet aircraft and improved flight control systems, are expected to cause significant shifts in the occupational structure of the air transportation industry over the decade ahead. (See volume IV, appendix G.) The demands of an expanding volume of traffic are expected to increase employment requirements for stewards and stewardesses, and these workers should make up a larger share of the industry's labor force in 1975. Rising passenger and cargo traffic also are expected to increase the need for operatives and clerical workers, which include aircraft and traffic servicing personnel, as well as traffic agents and reservation clerks. However, the increasing use of laborsaving innovations is expected to limit employment growth in some occupations. The utilization of electronic computers, both in the processing of paperwork and in machine-to-machine communications, should limit the growth of labor requirements for traffic agents and some types of clerical personnel. However, clerical workers as a group will account for a larger share of total employment in 1975. More advanced radio and telecommunication systems will result in a decline in the relative position of technicians, such as radio operators.

Although the need for pilots is expected to increase substantially, they will make up only a slightly larger share of total employment because of the greater use of jet aircraft having greater hauling capacities. Jet aircraft have lower maintenance requirements than piston engine aircraft; therefore, the ratio of airplane mechanics to total employment is expected to decline. In addition, there will be a shift in the occupational composition of airplane mechanics. Fewer engine overhaul mechanics will be needed because of the greater simplicity and reliability of jet engines. However, more airframe and systems mechanics will be required because of the increasing complexity of electrical, electronic, hydraulic, and other aircraft systems. Furthermore, the increasing use of more efficient cargo handling and loading equipment should limit the growth of employment requirements for freight-handling personnel.

Communications[89]

Current Employment

Approximately 927,000 wage and salary workers were employed in the communications major industry group in 1966. (See table 34.) About 8 out of 10 were employed by companies providing telephone services. The remaining workers were employed in radio broadcasting and television (12 percent); telegraph communications (4 percent); and communications services not elsewhere classified (about 1 percent).

Women workers accounted for nearly half of total employment in communications establishments in 1966, and nonsupervisory workers represented nearly four-fifths of the industry's work force. Among the individual industry groups, the proportion of nonsupervisory workers to total employment ranged from 69 percent in the telegraph communications industry to 81 percent in the radio broadcasting and television industry.

Employment Trends and Outlook

Estimated employment in the communications major industry group increased by nearly one-third between 1947 and 1957, but declined about 6 percent between 1957 and 1964.[90] Since 1964, employment has risen by nearly 10 percent. Employment was stimulated during the early post-World War II period by the rapid rise of

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[89] SIC 48. This major group includes companies furnishing point-to-point communication services, whether by wire or radio, and whether intended to be received aurally or visually; and radio broadcasting and television. Services for the exchange or recording of messages also are included.

[90] BLS establishment (payroll) data for the overall communications major industry group are available only for the years 1958-65 because of the exclusion of the radio broadcasting and TV industry group prior to 1958. However, 1947-57 BLS establishment data are available for the telephone and telegraph industries, which employed 87 percent of total employment in the communications major industry group in 1965. These data for 1947-57 were aggregated with unemployment insurance data for the broadcasting industry for the same years to provide estimates of employment trands for the total major industry group between 1947 and 1957.

Table 34. Distribution of Wage and Salary Workers in the Communications Major Industry Group, by Industry, 1966

(In thousands)

SIC Code	Industry	Wage and salary workers		Non-supervisory workers as percent of employment, by industry	Women workers as percent of employment, by industry
		Number	Percent distribution		
48	Communications----------------------	927.0	100.0	79.0	49.8
481	Telephone communication----------	773.4	83.4	79.7	55.3
482	Telegraph communication----------	33.0	3.6	69.1	(3)
483	Radio broadcasting and television---------------------------	112.2	12.1	80.7	21.8
489	Communication services, not elsewhere classified---------------	1/7.9	2/0.9	(3)	(3)

1/ Benchmark data for March 1966.
2/ Based on March 1966, total employment in the major industry group.
3/ Data are not available.

Note: Individual items may not add to totals because of the inclusion of benchmark data and/or rounding.

television broadcasting and the increased use of telephone communications. During the 1957-64 period, employment decreased in this major industry group, in part, because of the growing use of technological laborsaving devices such as automatic and direct dialing in telephone communications; computer systems for traffic and plant planning, supply operations, and equipment ordering; and the decreasing utilization of telegraph communications. By 1964, the impact of the change to automatic and direct dialing on employment was completed, and since that time, the growing demand for communication services has resulted in a rapid rise in employment for this major industry group.

Employment growth rates varied widely among the individual communications industry groups in the post-World War II period. Employment in radio broadcasting and television, spurred by the extremely rapid growth of television, increased more than one and a half times between 1947 and 1966. In sharp contrast, employment in telegraph communications declined by nearly half during the same period, primarily because of the greater use of competing services such as air mail, telephones, and data transmission by telephones.

Employment in telephone communications increased by nearly one-third between 1947 and 1966, rising from 585,000 to 773,000. Most of the increase occurred before 1957 and reflected the rapid growth of telephone services, resulting in part from the backlog of orders for new telephones accumulated during World War II. During the 1958-63 period, employment in telephone communications declined steadily, dropping to 686,000 in 1963. This decrease resulted primarily from the conversion to automatic and direct dial systems. By 1964, this conversion was largely completed and employment again began to increase in response to the rising demand for telephone services, reaching an all time high of 773,000 workers in 1966.

Between 1958 and 1966,[91] the proportion of nonsupervisory workers in this major industry group declined from 83 percent to 79 percent. The rate of decline was about the same in each of the industry groups.

Manpower requirements in the communications major industry group are expected to grow to over 1 million by 1975, an increase of about 10 percent. Employment trends for the individual industry groups are expected to differ widely. (See volume IV, appendix B.) Manpower requirements in the telephone communications industry will increase to over 865,000 by 1975 as the rapid rise in the demand for telephone services, the growth in household formations, and the increasing number and size of business and industrial establishments results in employment growth. However, these gains will be moderated by the continuing adaption and use of laborsaving technological innovations.

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[91] Data on nonsupervisory workers are not available prior to 1958.

A moderate increase is expected in manpower requirements for the radio broadcasting and television industry. Although the rise will not be as great as in the past, continuing increases in the number of radio and television broadcasting stations are expected to raise employment requirements despite the introduction of many laborsaving innovations. The downward trend in employment in telegraph communications is expected to continue through 1975, as strong competition from telephones, data transmission by telephone, and airmail services continue.

Occupational Structure

White-collar workers accounted for about 70 percent of total employment[92] in the communications major industry group in 1960. (See volume IV, appendix G.) This high proportion reflected the employment of especially large numbers of clerical workers in the telephone industry group (telephone operators), and technicians and managers in the radio broadcasting and television industry group. Telephone operators alone accounted for over one-fourth of the total employment in this major industry group. Craftsmen made up more than 90 percent of the small proportion of blue-collar workers; the dominant occupation in this group was lineman and serviceman, which includes three large, specialized groups of workers—central office craftsmen, installation and exchange repair craftsmen, and line, cable, and conduit craftsmen. Operatives, laborers, and service workers accounted for only a small proportion of total employment.

The occupational structure of the communications major industry group is dominated by the telephone industry group which employs more than 4 out of 5 workers. Occupational patterns in the telephone industry group are expected to change slowly by 1975. The proportion of clerical workers is expected to continue a long-term decline as direct dialing and automatic billing of long-distance calls, computerized handling of information and intercept calls, and other innovations reduce employment requirements for telephone operators. More extensive use of computers and advanced input devices for clerical functions, such as accounting, billing, and collecting, will be responsible for the reduction in the proportion of clerical workers needed to perform these functions. Professional and technical workers in the telephone industry group are expected to rise proportionately, mainly because of the increasing need for workers to design, service, or modify the complex equipment used in the industry, especially electronic switching equipment, multiplex transmission equipment, and electronic data processing equipment.

Craftsmen in the telephone industry are expected to increase as a proportion of total employment, in spite of technological innovations which tend to decrease requirements for these workers. The main reason for this paradox is an expected sharp increase in demand for telephone industry services which will disproportionately affect requirements for craftsmen. The outlook for the three groups of skilled workers within the craftsman category, however, will vary. The proportion of central office craftsmen will rise, mainly because the number of central offices will grow in response to increased telephone service requirements in suburban areas and rapidly rising demand for data communications services by business. Installation and repair craftsmen also will rise relatively. Although the need for these workers will be limited by the ease with which telephones can be serviced, the rising demand for telephone service will more than offset negative employment influences of new technology and installation practices. Line, cable, and conduit craftsmen are expected to decrease proportionately because of the increased use of microwave transmission, pulsecode modulation, and other forms of time and frequency multiplexing which allow more efficient use of wire and cable facilities.

In the radio broadcasting and television industry sector, the most significant change will be a decline in the proportion of professional and technical workers. The growing use of remote transmitter controls, the extensive use of taped recorded announcements in radio broadcasting, and film and video tape in television broadcasting tends to reduce manpower requirements for these workers, especially technicians. An increase in the proportion of managers in this industry sector will result from the growth in the number of small radio and television stations in which the ratio of managers is high.

In the telegraph industry, the most significant expected changes are an increase in the proportion of craftsmen. These highly skilled workers will be needed for the installation and maintenance of increasingly complex transmission systems. Clerical workers will decrease in proportion as the handling and transmitting of messages becomes more fully automated.

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[92] Including self-employed and unpaid family workers, as well as wage and salary workers.

Electric, Gas, and Sanitary Services[93]

Current Employment

An estimated 628,000 wage and salary workers were employed in the electric, gas, and sanitary services major industry group in 1966. (See table 35.) This major industry group includes three large industry groups–electric companies and systems (electric utilities)–which comprised about two-fifths of total employment in the major industry group in 1966; gas companies and systems (gas utilities), which employed one-fourth; and combination companies and systems (combination utilities) which accounted for over one-fourth. The remaining workers (about 7 percent) were employed in four smaller industry groups–water supply, sanitary services, steam companies and systems, and irrigation systems.

Nonsupervisory workers accounted for 87 percent of total employment in this major industry group in 1966. The individual industry groups had about the same proportion of nonsupervisory workers. Women workers accounted for 15 percent of the major industry's total employment. The variation in the proportion of women workers among the individual industry groups was small.

Employment Trends and Outlook

Employment in electric, gas, and sanitary services increased from about 498,000 to over 628,000 between 1947 and 1966.[94] Almost all of the increase occurred before 1957 when employment reached about 611,000. Since 1957, employment has remained relatively stable, ranging from about 610,000 to 628,000.

Although employment in each of the industry groups increased during the post-World War II period, the rates of growth varied considerably.[95] Employment in electric utilities increased by more than one-fifth between 1947 and 1966. However, the growth occurred during the early part of the period, and since 1957, employment has decreased slightly. The number of workers in gas utilities increased by nearly one-third between 1950 and 1959, and since then, it has remained relatively stable. Employment in the combination utilities sector has shown little change from 1950 to 1965, increasing from 169,000 to 177,000. Combined employment in the four smaller industry groups rose from 29,000 to 42,000 between 1957 and 1966, after remaining relatively stable from 1947 to 1957.

Employment in electric and gas utilities[96] has not matched the rapid expansion in output. Output increased by over 2½ times between 1947 and 1963, while employment increased by less than one-fourth. These variances reflect the growing use of laborsaving technological innovations such as improved electric generating plant equipment and improved facilities for the storage and liquification of natural gas.

Nonsupervisory workers decreased as a proportion of total employment in this major industry group, from 93 percent in 1950 to 87 percent in 1966. The rate of decline was much faster in electric utilities and gas utilities than in other sectors of the major industry group.

Employment requirements in the electric, gas, and sanitary services major industry group are expected to remain at about the same level between 1966 and 1975. The very large increases anticipated in the demand for the industry's products and services are expected to be nearly matched by rising output per worker resulting from the increasing use of laborsaving technological innovations.

Demand for the industry's services will be stimulated by increases in population and family formations. Gains in the number of appliances, including gas and electric air conditioners, will lead to greater consumption per residential customer. Industrial and commercial consumption of gas and electricity is expected to continue to its upward trend because of business expansion and

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[93] SIC 49. This major group includes companies engaged in the generation, transmission and/or distribution of electricity or gas or steam. Such companies and systems may be combinations of any of the above three services and also include other types of service such as transportation, communication, and refrigeration. Water and irrigation systems, and sanitary systems engaged in the collection and disposal of garbage, sewage, and other wastes by means of destroying or processing materials also are included.

[94] Workers employed by Federal, State and local government agencies or departments providing the services of this major industry group are not included in the employment data. This exclusion is particularly important in the water supply, sanitary services, steam companies and systems, and irrigation systems industry groups, as over 70 percent of the workers in these groups (combined), in 1960, were employed by Government agencies.

[95] BLS employment (payroll) data for the gas and the combination utilities industry groups are not available for the years prior to 1950.

[96] The analysis in this paragraph is limited to electric, gas, and combination utilities. Comparable output data are not available for water, steam, and sanitary services.

Table 35. Distribution of Wage and Salary Workers in the Electric, Gas, and Sanitary Services Major Industry Group, by Industry, 1966

(In thousands)

SIC Code	Industry	Wage and salary workers		Non-supervisory workers as percent of employment, by industry	Women workers as percent of employment, by industry
		Number	Percent distribution		
49	Electric, gas, sanitary services----	628.2	100.0	86.7	15.0
491	Electric companies and systems---	256.7	40.9	85.1	15.1
492	Gas companies and systems--------	152.2	24.2	86.5	16.3
493	Combination companies and systems------------------------	177.4	28.2	89.2	13.9
494-7	Water supply, sanitary services, steam companies and systems, and irrigation systems---------	41.9	6.7	87.4	13.8

Note: Individual items may not add to totals because of rounding.

the growing use of computers, electronic controls, and other electrical and electronic equipment.

Employment trends in the electric, gas, and sanitary services industry groups are expected to vary. (See volume IV, appendix B.) Although output of electric power is expected to double by 1975, a small employment decrease is expected in this industry segment, continuing the very slow downward trend that began in 1957. Employment in gas utilities is expected to increase somewhat, mainly as a result of an anticipated rapid rise in the consumption of gas. However, technological developments will limit employment growth. Employment in combination utilities is expected to remain at about the 1966 level through 1975. Rapid employment growth is expected in the four smaller industry groups combined, but because of the small size of these industry groups, the number of additional workers required will not be great.

Occupational Structure

Plant operations in the electric, gas, and sanitary services major industry group are highly mechanized and large numbers of skilled workers were employed in 1960 to install, maintain, repair, and operate this complex equipment. (See volume IV, appendix G.) There were, however, variations in occupational structure among the three sectors constituting the major industry group. For example, more than 7 out of 10 workers[97] in the sanitary services industry sector in 1960 were either truckdrivers or laborers–a reflection of the service orientation of the industry. Most of the laborers were street cleaners, trash and garbage collectors, or sewer cleaners.

In the electric, gas, and steam sectors, the ratios of professional workers and craftsmen were higher than the corresponding ratios in the major industry group, indicating the relatively more technical nature of electric generating processes. Many engineers were required to supervise construction, develop improved operating methods, and test the efficiency of new types of generating and transmission equipment. Linemen, the most prevalent skilled occupation, were used in large numbers to maintain the network of transmission lines between producers and consumers. About 1 out of 5 persons in the major industry was a clerical worker, a majority of whom were employed as meter readers.

In the electric, gas, and steam industry sectors, the most significant of the expected occupational changes will be increased in the proportion of professionals and craftsmen and decreases in the ratios of clerical workers and operatives. The ratio of engineers, technicians, and other professional workers is expected to rise as electronic instruments are more widely used; as larger generating units are put into use; and as generation by nuclear power increases the technical nature of the work in this industry segment. Much of the increase in professional and technical occupations will occur in computer-related jobs, as computers are used increasingly for clerical operations and for the control of electric generating stations, electric dispatching centers, and for gas distribution plants. The ratio of craftsmen to total utility employment also is expected to increase by 1975. Much of this increase will occur among maintenance workers, since the initial high cost of utility equipment, the considerable cost to the company when the most efficient equipment is not in operation, and the growing complexity of utility equipment will place a premium on preventive maintenance. On the other hand, the relative position of skilled operating personnel, such as stationary engineers (craftsmen, not elsewhere classified) is expected to decline as the duties of generator, turbines auxiliary, and gas compressor operators are performed increasingly by a single operator in a central control room. Manpower requirements for linemen will be tempered by the growing volume of line construction being contracted out and the spreading use of aerial lifts, rotating derricks, and other laborsaving innovations. However, the growing volume of line construction work, spurred by the development of high voltage lines capable of carrying electric power over long distances, should cause the proportion of linemen to increase moderately through the mid-1970's. The decrease in the proportion of clerical workers will stem in large measure from the relatively lower labor requirements for meter readers in the electric, gas, and steam industry sectors. Meter readers will be adversely affected by a growing trend toward more readily accessible outdoor meters; and meter reading on a bimonthly, quarterly, and even semiannual basis. The speed and efficiency of the growing numbers of computers in use by the industry will be reflected in lower concentrations of more routine jobs, such as hand bookkeeper and accounting clerks, and higher percentages of specialized clerical workers such as console operators and other computer-related personnel. Typically, less skilled workers, such as operatives and laborers, are most affected by technological change. This tendency is expected in the electric, gas, and steam industry sectors over the next decade as mechanization continues to improve efficiency and reduce the need for operatives, such as power station operators and laborers. Greater use of aerial lift trucks, pole grabbers, and hole digging equipment is expected to be particularly adverse to groundmen who aid line crews in erecting utility poles and repairing overhead power lines.

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[97] Including self-employed and unpaid family workers, as well as wage and salary workers.

In sanitary services, a decrease in the proportion of laborers and an increase in the ratio of truck drivers is expected by 1975. The ratio of laborers should decline as continuing improvements in sanitation trucks lead to fewer laborers per truck; as mechanized street cleaners are used increasingly; and as incineration plants become more mechanized. Truck drivers should increase because they will not be significantly affected by mechanization. Rising demand for sanitation services by a rapidly growing urban population also will contribute toward the expected rise in the proportion of truck drivers.

In the water supply and irrigation industry sector, the rising level of automation in water treatment and pumping plants, and the growing use of mechanical equipment in the installation and upkeep of water lines, should result in reductions in the relative position of operatives and laborers and substantial increases in the percentages of craftsmen, particularly maintenance workers such as mechanics and repairmen. A growing trend toward metered rather than fixed cost water billing methods should increase ratios of meter installers and repairmen, meter readers, and other clerical workers associated with billing and recordkeeping.

WHOLESALE AND RETAIL TRADES[98]

Current Employment

More than 13.2 million wage and salary workers were employed in the wholesale and retail trade in 1966. (See table 36.) Nearly three-fourths worked in retail trade establishments.

Nonsupervisory workers accounted for nearly 9 out of 10 workers in this industry division in 1966. The proportion of nonsupervisory workers was slightly higher in retail trade than in the industry division. Women workers represented almost two-fifths of total employment in the industry division. The proportion of women working in the retail trade was double the percentage in the wholesale trade.

Employment Trends and Outlook

Employment in the wholesale and retail trade increased rapidly between 1947 and 1966, rising from nearly 9 million to more than 13.2 million, or by about 47 percent. Between 1955 and 1966, employment in retail trade establishments rose slightly faster than in wholesale trade establishments. Retail trade employment increased from 7.7 million to almost 10 million, or by 30 percent, while employment in wholesale trade rose from approximately 2.8 million to about 3.4 million, or by 21 percent.

Employment growth in the post-World War II period resulted from population growth and rising per capita personal consumption expenditures. Between 1947 and 1966, population increased by 37 percent and per capita personal consumption expenditures (in 1958 dollars) by 48 percent.

Employment growth in both wholesale and retail establishments was limited somewhat by the increasing use of laborsaving technological innovations such as computers and automatic materials handling techniques. Employment in wholesale trade was affected more by mechanization than employment in retail trade because a larger proportion of wholesale trade employees were engaged in activities that lend themselves readily to mechanization, such as warehousing, and billing and other recordkeeping operations.

Nonsupervisory workers decreased as a proportion of total employment in this major division, from 79 percent in 1947 to 75 percent in 1966.[99] Both wholesale and retail trade experienced a small decrease in the proportion of nonsupervisory workers.

Manpower requirements in the wholesale and retail trade are expected to increase by over one-fifth between 1966 and 1975, rising from 13.2 million to over 16 million. (See volume IV, appendix B.) Employment growth will continue to be stimulated by gains in population and increases in consumer expenditures.

Table 36. Distribution of Wage and Salary Workers in the Wholesale and Retail Trade Industry Division, by Major Industry Group, 1966

(In thousands)

SIC Code	Industry	Wage and Salary workers: Number	Wage and Salary workers: Percent distribution	Non-supervisory workers as percent of employment, by industry	Women workers as percent of employment, by industry
F	Wholesale and retail trade	13,211	100.0	89.2	38.6
50	Wholesale trade	3,438	26.0	84.7	22.3
52-59	Retail trade	9,773	74.0	90.8	44.3

Note: Because of rounding, sums of individual items may not equal totals.

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[98] SIC Division F. This division includes establishments or places of business primarily engaged in selling merchandise to retailers; to industrial, commercial, institutional, or professional users; or acting as agents in buying merchandise for or selling merchandise to such persons or companies. Retail trade includes establishments engaged in selling merchandise for personal, household, or farm consumption, and rendering services incidental to the sale of the goods.

[99] Does not include comparable data on nonsupervisory workers in eating and drinking places. This information was not available prior to 1964.

However, employment requirements are expected to be slowed somewhat by the increasing application of laborsaving technology such as the greater use of electronic data processing equipment, automated warehousing equipment, growth in the number of self-service stores, and the extensive use of vending machines. Labor requirements are expected to increase slightly faster in the retail than in the wholesale trade.

Wholesale Trade

Current Employment

More than 3 million wage and salary workers were employed in wholesale trade establishments in 1966. (See table 37.) Over one-third of all wholesale trade employees worked in miscellaneous wholesale establishments, which include distributors of tobacco, beer, wine and distilled alcholic beverages; paper and paper products; furniture and house furnishings; lumber and construction materials; petroleum storage and distribution terminals; establishments engaged in the distribution of metals and minerals, except petroleum products and scrap; and establishments primarily engaged in assembling, sorting, and distributing scrap and waste materials. Almost one-fifth of all wholesale trade employees were employed in the distribution of machinery equipment and supplies, and nearly one-sixth were employed in the distribution of groceries and related products.

Nonsupervisory workers accounted for 85 percent of total wholesale trade employment in 1966. Among the individual wholesale industries, the proportions of production workers varied only slightly, ranging from 81 percent in dry goods and apparel to 88 percent in wholesale grocery establishments. Women workers accounted for 22 percent of all wholesale trade employment. The proportion of women workers ranged from 18 percent at distributors of motor vehicle and auto-

Table 37. Distribution of Wage and Salary Workers in the Wholesale Trade Major Industry Group, by Industry, 1966

(In thousands)

SIC Code	Industry	Wage and salary workers		Non-supervisory workers as percent of employment, by industry	Women workers as percent of employment, by industry
		Number	Percent distribution		
50	Wholesale trade-------------------	3,438.0	100.0	84.7	22.3
501	Motor vehicles and automotive equipment--------------------	261.1	7.6	83.8	18.1
502	Drugs, chemicals, and allied products---------------------	206.9	6.0	82.7	31.7
503	Dry goods and apparel-----------	142.8	4.2	81.2	43.6
504	Groceries and related products--	511.6	14.9	87.9	21.3
505	Farm products-raw materials (wholesale)------------------	1/93.2	2/2.8	(3)	(3)
506	Electrical goods----------------	272.0	7.9	82.4	23.1
507	Hardware, plumbing and heating goods-------------------------	154.5	4.5	84.9	21.4
508	Machinery equipment and supplies-	623.8	18.1	84.8	18.3
509	Miscellaneous wholesales--------	1,165.0	33.9	84.7	21.5

1/ Benchmark data for March 1966.
2/ Based on March 1966, total employment in the major industry group.
3/ Data are not available.

Note: Individual items may not add to totals because of the inclusion of benchmark data and/or rounding.

mobile equipment, and distributors of machinery, equipment and supplies to 44 percent in establishments distributing dry goods and apparel.

Employment Trends and Outlook

Employment in wholesale trade establishments increased from 2.4 million to 3.4 million between 1947 and 1966, an increase of more than two-fifths. Employment growth resulted from the expanding population and rising consumer expenditures. However, employment growth was slowed somewhat by the increased use of laborsaving innovations such as automatically controlled conveyors for sorting and moving goods in storage.

Between 1958 and 1966,[100] employment growth among the various sectors of the wholesale trade differed widely. Employment increased by over one-third in establishments distributing motor vehicles and automotive equipment; electrical goods; and machinery, equipment and supplies. On the other hand, there were only small increases in employment in establishments distributing hardware, plumbing, and heating goods, and in groceries and related products establishments.

Nonsupervisory workers decreased as a proportion of total wholesale employment, from 92 percent in 1947 to 85 percent in 1966. The rate of decline in recent years–1958-66 period– was somewhat slower in wholesale establishments distributing motor vehicles and accessories; groceries and related products; machinery equipment and supplies; drugs, chemicals, and allied products; and miscellaneous wholesale establishments than in the remaining 4 wholesale industry groups.

Manpower requirements in wholesale trade are expected to increase by over one-fourth between 1966 and 1975. (See volume IV, appendix B.) Employment will continue to be stimulated by a growing population and rising income, although technological innovations are expected to temper the rate of employment growth. For example, the efficiency of warehousing operations is expected to be increased by the greater use of improved palletizing methods and packaging of items in normal purchasing quantities (instead of by the dozen, gross, etc.), which should reduce materials handling. Greater use of electronic data processing equipment located at central locations of large multiunit trade organizations will substantially improve efficiency by facilitating control over customer accounts, sales and inventory data, and other operating information.

Occupational Structure

Reflecting the sales orientation of the industry, white-collar workers accounted for almost 7 out of 10 workers[101] in the wholesale trade major industry group in 1960. (See volume IV, appendix G.) On the other hand, many truck drivers and other operatives such as conveyor and forklift operators, also were employed, mostly in distribution and warehousing operations.

The occupational structure differed considerably among the sectors of the wholesale trade major industry group. The most notable difference was the much higher proportion of craftsmen and foremen employed in the machinery sector of wholesale trade. Most of these skilled workers were mechanics and repairmen, who were utilized to install and service machine and machine tools sold by the industry. Because food products are often distributed in limited quantities to large numbers of retail establishments, the need for drivers and materials handling workers was greater in food wholesaling than in the other industry segments.

The occupational structure in the wholesale trade is expected to be affected over the next decade by increasing efficiency of wholesaling operations through improvements in materials handling methods, packaging innovations, and greater use of computers for inventory control and billing operations. Automatically controlled conveyors for sorting and moving goods and for storing and selecting items for shipment also are expected to be used more widely. A growing number of these systems will be controlled by computers.

Such laborsaving innovations in combination with other marketing influences are expected to result in a moderate shift in the occupational composition of the wholesale trade major industry group by 1975. The most significant changes are expected in the managers occupational group and in the craftsmen group. The groceries and related products, the machinery and equipment, and the "other" wholesale trade sectors employ the largest numbers of workers and are among the fastest growing of the wholesale trade industry groups. Also, the size of these firms is expected to increase by 1975. Since larger establishments generally require fewer managers and officials relative to total employment, a decline in the proportion of managers, officials, and proprietors is expected in the wholesale trade by 1975. Craftsmen, on the other hand, are expected to increase as a percent of total employment. This increase will mainly reflect the greater need for foremen, and mechanics and repairmen to supervise the operation and repair of increasingly complex mechanized materials handling equipment. In machinery equipment wholesaling, the ratio of mechanics and repairmen is expected to increase rapidly because this growing industry relies more heavily upon the services of mechanics to maintain the increasing numbers of complex machinery being marketed. The expected increases in wholesale trade warehouse mechanization also is expected to cause laborers to decline slightly as a proportion of total employment.

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[100] BLS employment (payroll) data for all industry groups are not available for the years prior to 1958.

[101] Including self-employed and unpaid family workers, as well as wage and salary workers.

Retail Trade (SIC 52-59)

About 9.8 million wage and salary workers were employed in retail trade establishments in 1966. (See table 38.) More than 7 out of 10 retail trade employees worked either in general merchandise establishments such as department stores, mail order houses, and limited price variety stores; in eating and drinking places; in food stores; or for auto dealers and service stations. The remainder were employed in apparel and accessories stores; building materials, hardware, and farm equipment establishments; furniture and appliance stores; or in "miscellaneous" retail outlets.

Nonsupervisory workers accounted for over 90 percent of retail trade employment in 1966. Among the various industry groups within the retail trade, the proportion of nonsupervisory workers varied only slightly–from 86 percent in building materials, hardware and farm equipment to 93 percent in food stores. Women workers represented 44 percent of total employment in this major industry group. The proportion of women workers ranged from 11 percent in the automobile dealers and service station group to 69 percent in the general merchandise group.

Employment Trends and Outlook

Employment in retail trade establishments increased from 6.6 million to 9.8 million between 1947 and 1966, or approximately 50 percent. The gain in employment resulted from the Nation's growing population and rising per capita personal income. Employment growth was limited, however, by the increasing use of laborsaving innovations such as computers in recordkeeping operations and by self-service stores.

Between 1958 and 1966,[102] employment increased by about one-third in general merchandising establishments and in eating and drinking places. Employment remained relatively stable in building materials and hardware stores.

Manpower requirements in retail trade establishments are expected to increase by over one-fifth between 1966 and 1975, rising from 9.8 million to near 12 million. (See volume IV, appendix B.) Employment growth will continue to be stimulated primarily by population increases and a continuing high level of consumer expenditures. The continuing movement of the population from rural to urban areas and from cities to suburbs, and the trend toward longer store hours, also are expected to increase manpower requirement in retail trade. However, employment growth is expected to be slowed somewhat by the increasing efficiency of retailing operations through improvements in materials handling, packaging, and the spreading use of computers for inventory control and billing operations. Other factors likely to limit employment growth include the increasing use of automatic equipment in supermarkets, a rise in the number of self-service stores, and the anticipated rapid growth of machine vending.

Occupational Structure

More than a million and a half retail trade establishments in the Nation were engaged in nearly 100 different kinds of business in 1960, and the retail trade major industry group required very large numbers of both sales workers and managers and proprietors.

About 1 out of 4 workers[103] in retail establishments were a manager, official, or proprietor. Usually accounting for a substantial share of the work force in small establishments, managers and proprietors were especially prevalent in industry groupings such as gasoline service stations, miscellaneous retailing, food and dairy store, apparel and accessories stores, lumber, and building and farm equipment establishments. Reflecting the person to person nature of retail trade activities, sales workers accounted for one-fifth or more of the workers in every retail industry segment, except for gas stations and eating and drinking establishments. Service workers accounted for nearly one-sixth of total retail trade employment in 1960, although more than 7 out of 10 service workers were employed in one industry

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[102] Employment data in this section relate to self-employed and unpaid family workers, as well as wage and salary workers.

[103] Employment data in this section relate to self-employed and unpaid family workers, as well as wage and salary workers.

Table 38. Distribution of Wage and Salary Workers in the Retail Trade Major Industry Group, by Industry, 1966

(In thousands)

SIC Code	Industry	Wage and salary workers		Non-supervisory workers as percent of employment, by industry	Women workers as percent of employment, by industry
		Number	Percent distribution		
52-59	Retail trade	9,773.0	100.0	90.8	44.3
52	Building materials, hardware, farm equipment	539.9	5.5	86.0	15.5
53	General merchandise	1,968.8	20.1	92.0	69.0
531	Department stores	1,250.6	12.8	91.9	68.5
532	Mail order house	124.9	1.3	93.9	62.5
533	Limited price variety stores	319.9	3.3	93.6	80.7
534, 5, 9	Other general merchandising	1/256.7	2/2.7	(3)	(3)
54	Food stores	1,538.3	15.7	92.9	33.3
541-3	Grocery meat and vegetable stores	1,365.2	14.0	92.8	30.5
544	Candy, nut; and confectionery	1/ 28.3	2/0.3	(3)	(3)
545, 6, 9	Other food stores	1/142.7	2/1.5	(3)	(3)
55	Automobile dealers and service stations	1,470.0	15.0	(3)	10.7
551, 2	Motor vehicle dealers	737.8	7.5	85.5	10.2
56	Apparel and accessories stores	665.5	6.8	90.0	65.4
561	Men's and boys' apparel	111.2	1.1	90.6	37.9
562	Women's ready-to-wear	246.6	2.5	90.6	88.9
565	Family clothing stores	109.6	1.1	92.7	69.6
566	Shoe stores	129.3	1.3	87.1	34.8
57	Furniture and appliance stores	421.8	4.3	88.0	28.8
571	Furniture and home furnishing	272.0	2.8	87.9	29.5
572, 3	Home appliance stores	1/148.0	2/1.6	(3)	(3)
58	Eating and drinking places	2,063.8	21.1	93.4	57.3
59	Miscellaneous retail stores	1,105.4	11.3	(3)	43.8
591	Drugstores	420.1	4.3	91.1	58.2
594	Book and stationery stores	1/ 54.9	2/0.6	(3)	(3)
596	Farm and garden supply stores	95.7	1.0	(3)	18.2
597	Jewelry stores	1/ 67.1	2/0.7	(3)	(3)
598	Fuel and ice dealers	109.0	1.1	87.0	16.6
592, 3, 5, 9	Retail trade, not elsewhere classified	1/340.1	2/3.6	(3)	(3)

1/ Benchmark data for March 1966.
2/ Based on March 1966, total employment in the combined retail trade major industry groups.
3/ Data are not available.

Note: Individual items may not add to totals because of the inclusion of benchmark data and/or rounding.

segment—eating and drinking places. The vast majority of service workers were waiters and waitresses, cooks, bartenders, and counter and fountain workers. Clerical workers were important in all retailing sectors. Nearly one-fifth were employed in food and dairy stores, where labor requirements for cashiers were great. Ratios of clerical workers were lowest in gasoline service stations and in eating and drinking establishments. Because of the small size of many owner-operated establishments in these two industry sectors and the nature of the business operations, relatively few secretaries, bookkeepers, and other office workers were employed. The proportion of professional and technical workers was high in drug stores—almost 26 percent, compared to less than 2 percent for all retail trade—reflecting the employment of many pharmacists.

Operatives accounted for over half of total employment in gasoline service stations, compared with a ratio of 10 percent for the retail trade as a whole. In the gasoline service station sector, almost all workers in this occupation group were automotive service attendants. Other important operative occupations in the retail trade in 1960 included truckdriver, delivery man, and meat cutter. A majority of all craftsmen in the retail trade were mechanics and repairmen. Most mechanics and repairmen were motor vehicle mechanics, largely employed by motor vehicle and accessories establishments.

The personal nature of retailing activities is likely to insulate the industry's occupational structure during the next decade from substantial changes resulting from technological innovations. Notwithstanding, the repercussions of such technological developments and the relatively moderate occupational changes that are expected to occur in retailing by 1975 are likely to result more from changes in operating methods than changes in technology. A significant decline is expected in the ratio of managers, officials, and proprietors. Establishment size will continue to grow during the coming decade. As retailing sales increase and multiunit (chain) organizations become more prevalent, large establishments will require relatively fewer managers and a higher proportion of paid workers such as cashiers. Self-service, central check-out operations, already widely used in food and limited price variety retailing, are being adapted by other types of retail establishments–such as drug and clothing stores. Greater use of this method of operation should increase the relative proportion of clerical workers (cashiers) at the expense of sales workers.

Despite some adverse employment effects of automatic vending, the proportion of service workers is expected to increase as sales volume in eating and drinking establishments continue to increase, and limited price variety stores increase their food service operations.

Craftsmen are expected to increase as a proportion of total employment. The anticipated growth will result primarily from an increase in the proportion of mechanics and repairmen, especially motor vehicle mechanics, employed in motor vehicle and accessories establishments. These establishments are expected to increase their share of the automative service market (relatively to gasoline service stations and other service outlets) because of the advent of long term car warranties that tend to tie customers to new car dealerships, and an increase in the number of automobiles in use. The ratio of meat cutters is expected to decline. More meat cutting will be performed at specialized central locations, and personnel other than butchers will be used to weigh, price, and wrap meats.

FINANCE, INSURANCE, AND REAL ESTATE [104]

Current Employment

More than 3.1 million wage and salary workers were employed in the finance, real estate, and insurance industry division in 1966. (See table 39.) Insurance accounted for three-eighths of all employment in this division; banking accounted for more than one-fourth; and nearly one-fifth were employed in the real estate industry. Most of the remaining workers were in two major industry groups—credit agencies other than banks; and security and commodity brokers, dealers, exchanges and services.

Nonsupervisory workers accounted for 80 percent of total employment in finance, insurance, and real estate in 1966. The proportion of nonsupervisory workers ranged from 70 percent in insurance (excluding non-office salesmen) to 88 percent in security dealers and exchanges.

Women workers accounted for half of employment in finance, insurance, and real estate establishments, their proportion ranging from 32 percent in security dealers to 61 percent in banking.

Employment Trends and Outlook

Employment in finance, insurance, and real estate establishments increased from nearly 1.8 million in 1947 to over 3.1 million in 1966, or by about three-fourths. This rate of increase was almost twice as great as the rate of growth in nonagricultural employment over the same period.

Between 1958 and 1966,[105] employment growth rates varied widely among the major industry groups in this division. Employment increased by about one-half in two major industry groups—credit agencies other than banks; and security and commodity brokers, dealers, exchanges, and services. Employment rose by about one-third in both the banking industry and in the insurance agents, brokers, and insurance service industry. Although banking experienced the largest increase in total employment, its rate of increase was slowed by the expanding application of computers and related equipment to record keeping operations. Employment in each of the three remaining major industry groups—insurance carriers; real estate; and other finance, insurance, and real estate establishments rose by roughly one-tenth.

Finance, insurance, and real estate activities have expanded markedly with the postwar industrial and population growth. Between 1950 and 1963, for example, the amount of life insurance in force increased from $234 billion to $731 billion, while the value of property and casualty insurance premiums written rose from $6.9 billion to about $17 billion. During the same period, commercial bank checking accounts rose about two-fifths and the dollar value of their loans more than tripled. Since World War II, significant increases also have occurred in the volume of consumer credit outstanding and in the annual market value of securities sold. Assets of savings and loan associations increased, and because of the expansion in homebuilding, these additional funds found ready loan outlets. The increased volume of homebuilding and other construction activities also led to an increase in the number and size of real estate firms.

Manpower requirements in finance, insurance, and real estate establishments are expected to increase by approximately one-fifth between 1966 and 1975, rising from 3.1 million to about 3.7 million. (See volume IV, appendix B.) Employment will be stimulated by the same factors that influenced its growth during the postwar period. Increases will be slower than in the past decade, however, primarily because of the spreading use of electronic data processing equipment. However, these innovations will not affect employment equally in each of the major industry groups within this industry division.

In banking, technological change is expected to be a significant factor in limiting the growth of employment requirements, but not to the same extent that it has in recent years. Although insurance establishments are already extensively penetrated by modern equipment, future employment growth is expected to continue to be slowed as ADP equipment is introduced into new areas. The remaining major industry groups have experienced

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[104] SIC Division G. The division comprises establishments operating primarily in the fields of finance, insurance, and real estate. Finance includes banks and trust companies, credit agencies other than banks holding companies (but not predominantly operating), other investment companies, brokers and dealers in securities and commodity contracts, and security and commodity exchanges. Insurance covers carriers of all types of insurance, and insurance agents and brokers. Real estate includes owners, lessors, lessees, buyers, sellers, agents, and developers of real estate.

[105] BLS employment (payroll) data for most finance, insurance, and real estate industry groups are not available for the years prior to 1958.

Table 39. Distribution of Wage and Salary Workers in the Finance, Insurance, and Real Estate Division, by Major Industry Group, 1966

(In thousands)

SIC Code	Industry	Wage and salary workers		Non-supervisory workers as percent of employment, by industry	Women workers as percent of employment, by industry
		Number	Percent distribution		
G	Finance, insurance, and real estate	3,102.0	100.0	79.9	50.2
60	Banking	823.1	26.5	83.4	61.2
61	Credit agencies other than banks	335.0	10.8	79.7	53.8
62	Security dealers and exchanges	140.7	4.5	88.0	32.3
63	Insurance carriers	909.8	29.3	70.4	49.3
64	Insurance agents, bankers, and service	239.2	7.7	(3)	56.2
65	Real estate	573.2	18.5	(3)	35.5
66	Combination of real estate, insurance, loans, law offices	1/50.7	2/1.7	(3)	(3)
67	Holding and other investment companies	1/29.5	2/1.0	(3)	(3)

1/ Benchmark data for March 1966.
2/ Based on March 1966, total employment in the industry division.
3/ Data are not available.

Note: Individual items may not add to totals because of the inclusion of benchmark data and/or rounding.

relatively little mechanization to date. However, future employment growth is expected to be limited somewhat by increasing use of computers and related equipment in repetitive clerical operations.

Finance[106]

Current Employment

Over 1.3 million wage and salary workers were employed in the finance major industry groups in 1966. (See table 40.) More than 6 out of 10 workers were employed in banking institutions; about one-fourth worked in credit agencies other than banks, and the remaining workers were employed either by security dealers and exchanges or by holding and other investment companies.

Nonsupervisory workers account for a high proportion of wage and salary workers in finance. In 1966, they accounted for nearly 9 out of 10 workers employed by security dealers and exchanges and more than 8 out of 10 workers in banking and credit agencies other than banks.

Women workers accounted for a large share of the work force in the finance industry. In 1966, more than three-fifths of the 823,100 wage and salary workers in banking were women. In other finance industries, the proportion of women workers ranged from about

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[106] SIC 60,61,62, and 67. These major groups comprise institutions that are engaged in deposit banking or closely related functions, including fiduciary activities; establishments engaged in extending credit in the form of loans but not engaged in deposit banking; establishments engaged in underwriting, purchase, sale, or brokerage of securities and other financial contracts on their own account or for the account of others and exchanges, clearing houses and other services allied with the exchange of securities and commodities; and investment trusts, investment companies, holding companies, and commodity trading companies.

Discussion includes employment in SIC 67, Holdings and Other Investment Companies, included in the Industry-Occupational patterns in table 40, and volume IV, appendix G, as part of the Finance segment of the Major Industry Division.

Table 40. Distribution of Wage and Salary Workers in the Finance Major Industry Groups, by Industry, 1966

(In thousands)

SIC Code	Industry	Wage and salary workers		Non-supervisory workers as percent of employment, by industry	Women workers as percent of employment, by industry
		Number	Percent distribution		
60, 61, 62, 67	Finance	1/1,328.3	100.0	(4)	(4)
60	Banking	823.1	62.0	83.4	61.2
61	Credit agencies other than banks	335.0	25.2	79.7	53.8
612	Savings and loan associations	96.3	7.2	80.8	63.3
614	Personal credit institutions	180.0	13.6	(4)	(4)
611, 3, 5, 6	Other credit agencies	2/58.9	3/4.5	(4)	(4)
62	Security dealers and exchanges	140.7	10.6	88.0	32.3
67	Holdings and other investment companies	2/29.5	3/2.3	(4)	(4)

1/ Includes March benchmark data for SIC 67.
2/ Benchmark data for March 1966.
3/ Based on March 1966, total employment in the industry group.
4/ Data are not available.

Note: Individual items may not add to totals because of the inclusion of benchmark data and/or rounding.

one-third in security dealers and exchanges to over three-fifths in savings and loan associations.

Employment Trends and Outlook

Employment in the finance major industry groups rose from about 1 million in 1959[107] to 1.3 million in 1966, an increase of approximately 33 percent. This increase occurred despite the advancing automation of banking and other financial operations. In banking, where the majority of finance workers are employed, employment rose sharply to service the needs of a growing population and activities associated with increases in personal and corporate income. For example, between 1951 and 1964, the total number of checks handled by the Federal Reserve System more than doubled. In addition, banks have introduced many new services and expanded old ones such as accepting payment for utility bills, reconciling business checking accounts, and expanding branch office facilities.

Manpower requirements in finance are expected to advance over one-third between 1966 and 1975, to nearly 1.8 million. (See volume IV, appendix B.) Many of the past trends responsible for the growth in finance activity and employment are expected to continue through the mid-1970's. Factors such as an increasing population, rising income levels, growing use of credit, and, in banking, the increasing popularity of personal checking accounts, are expected to contribute to employment growth in the finance industry. Differences in the rates of employment expansion are expected among the finance major industry groups because the growth in demand varies from sector to sector, and new technology has a greater impact on some sectors than others. For example, despite the growing use of computers and other laborsaving devices in credit agencies, manpower requirements in these establishments are expected to increase over the next decade by more than half; rising from about 335,000 to 510,000 because of the continuing rapid growth in the use of personal and business credit. On the other hand, manpower requirements in banking are expected to increase slower–about one-third–from 823,100 to nearly 1.1 million. The increasing use of electronic data processing equipment by banks will tend to moderate employment growth in this sector.

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[107] BLS employment (payroll) data are not available for all finance major industry groups for the years prior to 1959.

Occupational Structure

The complicated financial transactions of today's business world require the services of hundreds of thousands of white-collar workers. In 1960, (see volume IV, appendix G), white-collar workers accounted for more than 9 out of 10 workers employed[108] in finance. More than three-fifths were clerical workers employed as tellers; stenographers, typists, and secretaries; bookkeepers; office machine operators; or "other clerical workers," such as account analysts, board operators, safety deposit clerks, telephone quotation clerks, transfer clerks, messengers, and pneumatic tube men.

Managers, officials, and proprietors accounted for more than one-fourth of the workers in finance, reflecting the relatively large number of financial establishments, including branch banks and investment establishments.

Professional and technical personnel and sales workers, combined, made up less than 5 percent of the work force in finance in 1960. By far, the highest proportions of these workers were employed by stock brokers and other investment companies. Included in the sales group are stock and bond salesmen, as well as "representatives" and agents of brokerage and investment firms. The professional and technical group includes a substantial proportion of accountants and auditors, the remainder being employed in occupations such as lawyers, and economists and statisticians who do industry and other types of economic analyses.

The effects of most of these technological developments will be felt primarily by workers in the clerical occupational group. In banking, EDP is expected to be extended to additional functions, including consumer credit, check account reconciliation, and customer payroll activities. This should add to the volume of banking business with little increase in requirements for clerical workers. Likewise, the use of checks coded with Magnetic Ink Character Recognition numerals should permit banks to handle a substantially greater number of checks without a corresponding increase in the need for bookkeepers and other clerical workers. In general, declines in manpower requirements for clerical workers in banking will be particularly sharp in occupations concerned with check tabulation, sorting, and clearance; account maintenance and statement preparation; and other routine banking functions for which the application of new automatic processing equipment is most suited.

Increasing use of EDP in stock exchanges is expected to reduce employment requirements for telephone quotation clerks, messengers, floor reporters, and pneumatic-tube-men—mostly occupations in the residual other clerical workers classification. A central certificate service that records each firm's securities balances could eliminate most transfer clerk positions by 1975. Board operators also will be adversely affected as computers are used increasingly to control the information on stock quotation boards. On the other hand, the accelerating use of computers in this industry should dramatically increase the ratio of office machine operators such as console and keypunch operators.

The higher capital requirements for trading operations and the need for expensive EDP equipment are expected to cause the current trend toward merger and consolidation of brokerage houses to continue. The movement towards fewer but larger firms could culminate in a lower concentration of both clerical and managerial workers in this industry sector by 1975. The 1975 outlook for managers and officials of banks appears more promising. As banks continue to open new branch offices and expand their volume of business and customer services, requirements for bank officers in areas requiring personal attention, such as credit, trusts, and investment, should grow.

The proportions of professional and sales workers are expected to increase in stock broker and investment companies. Increasing capital demands by business and a growing volume of security transactions should raise employment requirements for stock brokers and salesmen, as well as investment counselors and advisors. Economists and analysts are among professional workers most likely to benefit from the increasing emphasis expected to be placed upon research in all fields of investment activity. Accountants and auditors, however, may not fare quite so well. Increasing use of integrated EDP accounting systems and the greater accuracy of such systems should cause the proportion of these workers to decline somewhat by 1975.

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[108] Including self-employed and unpaid family workers, as well as wage and salary workers.

Insurance[109]

Current Employment

Of the more than 1.1 million wage and salary workers employed in the insurance major industry group in 1966, almost 910,000 were employed by insurance carriers; the remaining 239,000 were employed by insurance agents, brokers, and services establishments. (See table 41.) Within the insurance carrier industry, more than half of all wage and salary workers were employed by life insurance firms.

Nonsupervisory workers accounted for 7 out of 10 employees in insurance carriers establishments. In the life insurance industry group, the ratio of nonsupervisory workers was 58 percent, compared to about 86 percent in the accident and health insurance group, and 84 percent in the fire, marine, and casualty insurance group.

Women workers accounted for slightly less than half of the employment in insurance carrier establishments, while in insurance agent, broker, and service firms, over half the workers were women.

Employment Trends and Outlook

Insurance employment rose rapidly during the post-World War II period, and since 1958, it increased by about 150,000, to more than 1.1 million workers in 1966.[110] During this 7-year period, employment in insurance carrier establishments rose by about 12 percent, while the numbers of workers in insurance agents, brokers, and service establishments increased by about 29 percent.

Insurance sales and employment rose rapidly during the post-World War II period, mainly because of a rising population of persons aged 15 to 44–the group which accounts for most insurance sales. Other factors contributing to this growth included rising personal income and longer life expectancy.

Manpower requirements in insurance are expected to grow to about 1.25 million by 1975, an increase of about 125,000 workers. (See volume IV, appendix B.) Employment growth will be stimulated by the same factors that influenced growth in the insurance industry during the post-World War II period. Employment, however, is not expected to rise as fast as the growth in insurance activity because the increasing use of computers will moderate the demand for manpower.

Occupational Structure

Servicing the millions of insurance policies in force in the United States requires a vast amount of paperwork and occupies the time of hundreds of thousands of clerical workers. Accordingly, nearly half of all workers in the insurance major industry group in 1960 worked at clerical jobs. (See volume IV, appendix G.) About half of these workers were secretaries, stenographers, and typists; operators of bookkeeping and other office machines; or accounting clerks. Other clerks, employed mostly in home offices, had specialized jobs found only in the insurance business such as policywriter, policy change clerk, insurance checker, and claim adjuster.

Sales workers–a key group in the insurance business–accounted for one-third of the workers in the insurance industry in1960. Nearly all of these workers were agents or brokers who sold policies directly to individuals and business firms.

Over one-eighth of all workers were employed as a manager, official, or proprietor, reflecting, in part, the large number of branch offices maintained by insurance companies, and the prevalence of independent insurance brokerage firms. Managers employed in home offices were usually company officials or administrators responsible for policy issuance, accounting, investments, and other office activities.

Of the relatively few professional and technical workers employed by insurance firms in 1960, more than 2 out of 5 were accountants and auditors who dealt primarily with insurance company records and financial problems relating to premiums, investments, and payments to policyholders.

Over the decade ahead, the expanding use of electronic data processing (EDP) and data transmission equipment is expected to result in a moderate shift in the occupational composition of the insurance industry.

Insurance companies now have electronic data processing for such high-volume tasks as premium billing and accounting, reserve and commission accounting, and dividend accounting. As more of these functions are performed by EDP equipment, an increasing number of firms will establish integrated EDP systems capable of handling a large number of operations through a single master policy record contained in the computer file. As a result, clerical posting jobs will be reduced, fewer control audits will be required, and separate records eliminated.

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[109] SIC 63 and SIC 64. These industry groups include insurance carriers of all types and agents and brokers dealing in insurance, and also organizations offering services to insurance companies and to policy holders.

[110] BLS employment (payroll) data for the major industry group are not available for the years prior to 1958.

Table 41. Distribution of Wage and Salary Workers in the Insurance Major Industry Group, by Industry, 1966

(In thousands)

SIC Code	Industry	Wage and salary workers		Non-supervisory workers as percent of employment, by industry	Women workers as percent of employment, by industry
		Number	Percent distribution		
63	Insurance carriers	909.8	100.0	70.4	49.3
631	Life insurance	486.6	53.5	58.1	42.1
632	Accident and health insurance	60.1	6.6	86.4	70.4
633	Fire, marine, and casualty insurance	322.2	35.4	84.3	55.5
635, 6, 9	Other insurance carriers	1/41.9	2/4.7	(3)	(3)
64	Insurance agents, brokers, and services	239.2	100.0	(3)	56.2

1/ Benchmark data for March 1966.
2/ Based on March 1966, total employment in the major industry group.
3/ Data are not available.

Note: Individual items may not add to totals because of the inclusion of benchmark data and/or rounding.

Data transmission systems will be increasingly used to send information from field offices to home office computer centers, or to link district computer centers. The expanded use of such equipment is expected to reduce the number of field office employees engaged in recordkeeping functions without comparable increases in requirements for home office personnel. Various reading and sensing techniques will be used more widely in areas such as premium collection. For example, check-writing and handling operations are being coordinated with magnetic ink character recognition systems similar to those used by banks. These developments are designed to reduce the amount of input preparation work.

In addition to improvements in data processing techniques, insurance employment also will be affected by changes in marketing methods and industry organization. For example, direct selling (using mail, advertising, and company agents) is increasing, particularly in the case of automobile lines. Direct premium billing by the carrier's home office is reducing agency recordkeeping, facilitating consolidation of records, and reducing service costs per policy. Carrier consolidation has been encouraged by changes in State regulatory laws that now allow fire and casualty companies to write all types of nonlife lines. Consolidated insurance companies can service several lines of insurance, resulting in some reduction in unit labor requirements.

Such developments are expected to result in a slightly lower ratio of clerical workers by 1975. However, divergent trends are expected among individual clerical occupations. For example, the trend toward centralized billing activity by means of EDP, and increasing reliance on EDP for recordkeeping and other routine clerical functions, is likely to reduce the ratio of workers such as billing and accounting clerks, bookkeepers, insurance checkers, and most filing and posting workers. Anticipated advances in the application of EDP could virtually eliminate card tabulating departments from insurance firms in the years ahead, precipitating a rapid decline in the number of tabulating machine and electronic accounting machine operators.

Real Estate[111]

Current Employment

About 573,000 wage and salary workers were employed in the real estate major industry group in 1966. (See table 42.) More than 8 out of 10 of these workers were in operator or lessor establishments, including operators of nonresidential and apartment developments and lessors of real property such as farms and forests; title abstract companies; or in agents, brokers, or managers establishments. The remaining real estate workers were employed either by operative builders (firms engaged primarily in construction for sale or for their own account) or by subdividers and developers.

Employment Trends and Outlook

Employment in the real estate major industry group increased from about 507,000 in 1958[112] to 573,000 in 1966, or by 13 percent. This employment growth resulted primarily from rising building activity, particularly residential housing and commercial structures. Housing activity was stimulated by the shift of families from cities to suburbs and from rural to urbans areas; rising personal income; and favorable credit terms, resulting mainly from Government legislation such as Veterans' Administration (VA) and Federal Housing Administration (FHA) home loan guarantees. Between 1958 and 1966, employment grew fastest in operative builders, subdividers, and developers establishments. Among the remaining real estate establishments, employment was relatively stable in the operators and lessors group and increased somewhat in the agents, brokers, and managers sector.

Between 1959 and 1966,[113] employment in combinations of real estate, insurance, loans, and law offices dropped from about 57,000 to approximately 51,000. This drop reflected, in large part, the shift of these activities into separate establishments specializing in real estate, insurance, loans, or law.

Manpower requirements in the real estate industry are expected to rise by about 13 percent between 1966 and 1975, rising from 573,000 to about 650,000. (See volume IV, appendix B.) Employment growth will be stimulated by the same factors that influenced its growth during the post-war period. Technological change is not expected to affect real estate employment growth significantly through the mid-1970's because of the small size of the average real estate firm and because the industry is service-oriented.

Little change in employment is expected in establishments engaged in combination real estate, insurance, loans, and law activities. Growth in real estate, insurance, and other activities performed in these establishments will be offset by greater separate specialization in these services.

Occupational Structure

Sales workers are responsible for nearly all property transactions. In 1960, they were the largest occupational group in the real estate industry, accounting for about 3 out of 10 employees.[114] (See volume IV, appendix G.) Nearly all sales workers were employed as real estate agents and brokers, and most specialized in residential sales. This industry had an exceptionally large proportion of managers, officials, and proprietors, a reflection of the large number of small firms selling real estate. About 1 out of 6 employees was a clerical worker. The proportion (7 percent) of stenographers, typists and secretaries to total employment was especially high because of the prevalence of small firms, each usually requiring at least one secretary or typist.

Many service workers were employed by real estate management firms to clean and service apartment and commercial buildings. Service occupations, such as janitor and charwoman, accounted for a substantial majority of employment in the service workers occupational group.

Several developments in the industry are expected to cause a substantial change in the occupational composi-

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[111] SIC 65 and 66. These major groups comprise real estate operators and owners and lessors of real property; title abstract companies; buyers, sellers, developers, agents, and brokers; as well as employment in establishments which are regularly engaged in any combination of real estate, insurance, loans, or the practice of law, where no one of these activities constitute the principal business. This section discusses mainly employment in real estate (SIC 65), which constitutes more than 90 percent of total wage and salary employment in these major groups.

[112] BLS employment (payroll) data for the real estate major industry group are not available for the years prior to 1958.

[113] BLS employment (payroll) data for the combinations of real estate, insurance, loans, and law offices major industry group are not available for the years prior to 1959 (benchmark data for March).

[114] Including self-employed and unpaid family workers, as well as wage and salary workers.

Table 42. Distribution of Wage and Salary Workers in the Real Estate Major Industry Groups, by Industry, 1966

(In thousands)

SIC Code	Industry	Wage and salary workers		Women workers as percent of employment, by industry
		Number	Percent distribution	
65	Real estate	573.2	100.0	35.5
651, 3, 4	Real estate, other 1/	2/457.6	3/81.1	(4)
655	Subdividers and developers	2/ 62.6	3/11.1	(4)
656	Operative builders	41.0	7.2	13.9
66	Combination of real estate, insurance, loans, and law offices	2/ 50.7	100.0	(4)

1/ Includes real estate operators (except developers) and lessors (651); agents, brokers, and managers (653); and title abstract companies (654).

2/ Benchmark data for March 1966.

3/ Based on March 1966, total employment in the major industry group.

4/ Data are not available.

Note: Individual items may not add to totals because of the inclusion of benchmark data and/or rounding.

tion by 1975. The proportion of service workers will decline sharply over the next decade as growing numbers of real estate firms contract out much of the maintenance and service activities presently performed by their own employees. Accordingly, the industry's requirements for janitors, charwomen, and other service workers will be reduced.

On the other hand, the percentage of sales workers is expected to rise considerably because a growing population and an expanding economy stimulate a strong demand for housing and a wide variety of commercial structures. High population mobility, continuing migration to metropolitan areas, and increasing urban renewal activity all are expected to spur continued increase in real estate business activity.

The growing number of persons in both the 20 to 30 and over 60 age groups is expected to stimulate a strong demand for apartment housing over the decade ahead and cause the proportion of apartment and building managers to increase.

Electronic data processing and other new types of office machines are likely to be used increasingly over the next decade in the real estate industry, particularly in large firms. The laborsaving effects of such technological innovations will undoubtedly slow the employment growth of such clerical occupations as billing clerk, bookkeeper, tabulating machine operator, and other routine clerical jobs. However, the ratio of most clerical occupations will increase somewhat by 1975 as additional workers—particularly stenographers, typists, and secretaries—are required to handle the mounting paperwork associated with a growing volume of real estate activity.

SERVICES AND MISCELLANEOUS[115]

Current Employment

More than 9.5 million wage and salary workers were employed in the services and miscellaneous industries division in 1966. (See table 43.) Medical and other health services constituted almost one-fourth of total wage and salary employment; miscellaneous business services accounted for 13 percent; and personal and educational services each accounted for more than 10 percent. Other major industry groups having significant numbers of workers were hotels and other lodging places, legal services, motion pictures, and miscellaneous services. Most of the remaining workers were employed in automobile repair services; miscellaneous repair services; amusement and recreation services; museums, art galleries, botanical and zoological gardens; private households; and nonprofit membership organizations.

Employment Trends and Outlook

Employment in the services and miscellaneous industries increased from almost 5.1 million in 1947 to over 9.5 million in 1966, or by about 85 percent. Employment growth resulted primarily from increases in population, rapid rise in personal disposable income, expanding economic activity, and growing demand for services that add to people's convenience and comfort.

Between 1958 and 1966,[116] employment grew in all but one of the services and miscellaneous industries division major industry groups. Miscellaneous business services, the fastest growing major industry group, increased by more than 90 percent over this period, as rising levels of business activity spurred increased expenditures by business firms on such services as management consulting, research and development work, consumer-credit reporting, building maintenance, and advertising. In medical and other health services, employment increased by more than three-fifths, primarily reflecting the expanding population and its increasing proportion of very young and very old people—the groups most in need of medical care—and an increase in expenditures for health and medical care. Employment in miscellaneous services grew by more than one-half; educational services by more than two-fifths; legal services by more than two-fifths; and hotels and other lodging places by nearly 30 percent. Personal services grew moderately by about one-sixth, while motion picture employment decreased about 4 percent.

Between March 1959 and March 1966,[117] employment in miscellaneous repairs services and amusement and recreation services each grew by more than one-fourth, automobile repair employment by about two-fifths, and nonprofit membership organizations by one-sixth. During the same period, employment in museums and art galleries grew much faster—by about three-fourths.

Manpower requirements in the services and miscellaneous industries division are expected to increase from over 9.5 million in 1966 to nearly 13 million in 1975, or approximately 36 percent. (See volume IV, appendix B.) Factors that will contribute to the rapid increase in employment requirements include continuing population gains; expanding interest in preventive medicine and rehabilitation of the handicapped; and the more frequent use of beauty parlors, restaurants, and other services by families and individuals as income levels rise and leisure-time increases; and as a growing number of housewives take jobs outside the home.

Growth in employment requirements in educational services is expected to be especially rapid (more than one-half) as more young people attend schools at all levels. Expanding Government assistance to vocational and adult education, youth, the disadvantaged, and the unemployed also will increase the need for workers in

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[115] SIC Division H, 07-09, and 99. This classification includes establishments primarily engaged in rendering a wide variety of services to individuals and business establishments. Hotels and other lodging places, and establishments providing personal, business, repair, and amusement services; medical, legal, engineering and other professional services; educational institutions; nonprofit membership organizations, and other miscellaneous services are included. Also included are establishments primarily engaged in performing agricultural, animal husbandry, and horticultural services on a fee or contract basis; commercial hunting and trapping, and the operation of game preserves; and establishments primarily engaged in the operation of timber tracts, forest nurseries, and related activities. Commercial fishing, the operation of oyster farms, the tonging and dredging of oysters, the gathering of sponges, seaweed, etc., and the operation of fish hatcheries or fishing preservies, as well as nonclassified establishments, also are included.

Because of differences between the industrial classification used in the Census of Population and BLS wage and salary data, employment in establishments primarily engaged in performing agricultural, animal husbandry, and horticultural services on a fee or contract basis (except grist mills) also is included in the discussion of agricultural employment, including the distribution of employment by occupational group and major occupation.

[116] BLS employment (payroll) data are not available for all major industry groups for the years prior to 1958.

[117] BLS employment (payroll) data are not available for the years prior to 1959 (benchmark data for March).

Table 43. Distribution of Wage and Salary Workers in the Services and Miscellaneous Industries Division, by Major Industry Group, 1966

(In thousands)

SIC Code	Industry	Wage and salary workers	
		Number	Percent distribution
H, 07-09, 99	Services, total	9,545.0	100.0
70	Hotels, rooming houses, camps and other lodging places	684.6	7.2
72	Personal services	1,012.9	10.6
73	Miscellaneous business services	1,220.2	12.8
75	Automobile repair, automobile services and garages	1/334.5	2/3.6
76	Miscellaneous repair services	1/161.2	2/1.7
78	Motion pictures	190.2	2.0
79	Amusement and recreation services except motion pictures	1/366.4	2/3.9
80	Medical and other health services	2,206.5	23.1
81	Legal services	190.3	2.0
82	Educational services	968.1	10.1
84	Museums, art galleries, botanical and zoological gardens	1/ 13.8	2/0.1
86	Nonprofit membership organizations	1/1,447.4	15.6
89	Miscellaneous services	488.5	5.1
07-09	Agricultural services, forestry, fisheries	1/151.6	2/1.6
99	Nonclassifiable establishments	1/ 21.0	2/0.2

1/ Benchmark data for March 1966.
2/ Based on March 1966, total employment in the industry division.

Note: Individual items may not add to totals because of the inclusion of benchmark data and/or rounding.

educational services. Manpower requirements in business services of all kinds also are expected to grow rapidly as business firms rely increasingly on specialists to handle such functions as advertising, accounting, and maintenance. Technological developments are not expected to limit employment growth in these industries significantly because of the person-to-person nature of much of the work performed in service establishments. In addition, many of the establishments are small and have limited investment potential, a factor likely to slow the introduction of laborsaving technological innovations. However, clerical workers will probably be affected somewhat by the increasing use of laborsaving office machines and data processing equipment by small firms.

Hotels, Rooming Houses, Camps, and Other Lodging Places[118]

Current Employment

Approximately 685,000 wage and salary workers were employed in the hotels, rooming houses, camps, and other lodging places major industry group in 1966. (See table 44.) Almost 9 out of 10 of these workers were employed by hotels, motels, or tourist courts. The remaining employees worked in rooming and boarding houses, trailer parks and camps, and organization hotels and lodging places run on a membership basis.

Nonsupervisory workers accounted for 94 percent of employment in hotels, motels, and tourist courts. About half of the workers in this industry sector were women.

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[118] SIC 70. This major group includes commercial establishments and institutions engaged in furnishing lodging, or lodging and meals, camping space and camping facilities, on a fee basis.

Table 44. Distribution of Wage and Salary Workers in the Hotels, Rooming Houses, Camps, and Other Lodging Places Major Industry Group, by Industry, 1966

SIC Code	Industry	Wage and salary workers		Non-supervisory workers as percent of employment, by industry	Women workers as percent of employment, by industry
		Number	Percent distribution		
70	Hotels and lodging places----------	684.6	100.0	(3)	(3)
701	Hotels, tourist courts, and motels---------------------------	610.1	89.1	93.6	49.3
702-4	Other lodging places-------------	1/56.2	2/8.9	(3)	(3)

1/ Benchmark data for March 1966.
2/ Based on March 1966, total employment in the major industry group.
3/ Data are not available.

Note: Individual items may not add to totals because of the inclusion of benchmark data and/or rounding.

Employment Trends and Outlook

Employment in the hotels, rooming houses, camps, and other lodging places major industry group increased by more than one-third between 1947 and 1966, rising from 506,000 to 685,000. Most of the employment growth occurred during the 1958-66 period. Employment grew by about 29 percent in hotels, tourist courts, and motels during this period. Although the number of hotels decreased by about 22 percent between 1958 and 1963, this decline was more than offset by an increase in the number of motels. This trend was reflected similarly in employment–hotel employment declined by 10 percent and motel employment increased 27 percent over the 1958-63 period.

Manpower requirements in this major industry group are expected to rise to about 820,000 in 1975, an increase of almost 20 percent. (See volume IV, appendix B.) The anticipated employment growth will result partly from increasing travel associated with higher levels of business activity, expanding population, greater personal income, and more leisure time. In addition, employment expansion will be stimulated by the greater variety of hotel services and accommodations; for example, conferences and banquet services, recreational facilities such as tennis courts and swimming pools, weekend entertainment programs, shuttle services, and vacation "packages" offered in conjunction with transportation companies. Greater use of "Instant hotels"–low cost mobile units that can be quickly placed in anticipation of a heavy influx of travelers–also will stimulate employment. Technological change is not expected to limit employment growth significantly in this major industry group through the mid-1970's, since the personal nature of many of the services performed does not lend itself to mechanization. However, employment requirements for clerical workers and kitchen helpers will be adversely affected by mechanical aids.

Occupational Structure

Reflecting the personal nature of much of the work performed in the industry, service workers accounted for nearly three-fifths of total employment[119] in the hotels, rooming houses, camps, and other lodging places major industry group in 1960. (See volume IV, appendix G.)

Waiters and waitresses, and cooks were the two largest service occupations, although they accounted for only about one-fifth of all service workers. Another large group of service workers were employed in the housekeeping occupations. Maids, porters, housemen, and linen room attendants were among workers assigned to "back of the house" jobs to make beds, clean rooms and halls, move furniture, hang draperies, and provide guests with fresh linens and towels. Women were usually employed for the lighter housekeeping tasks, whereas men had jobs requiring more strenuous physical effort, such as washing walls and arranging furniture.

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[119] Including self-employed and unpaid family workers, as well as wage and salary workers.

In most hotels, a uniformed staff, including bellmen, doormen, and elevator operators, performed services in the lobby. Other types of service occupations common in the industry were bartender, barber, beauty salon operator, recreation worker, detective, valet, and various helpers. The personal nature of the services rendered by lodging establishments and the considerable number of smaller motels and other accomodations managed and operated with little paid help is reflected in the high concentration of managerial workers–more than one-fifth of the workers in the industry. In addition to a general manager in charge of overall operations, most larger hotels employed management specialists in such areas as food service, sales, credit, purchasing, front office, and clerical operations. About 1 out of 10 workers in the lodging industry in 1960 was a clerical worker. About half of hotel clerical workers were front office employees working at jobs such as room clerk, key clerk, mail clerk, and information clerk. The remainder, mainly women, were employed in a variety of office occupations, including telephone operator, cashier, and secretary. The combined total of professional, blue-collar, and sales workers represented less than 10 percent of the workers in the major industry. The largest occupations within this group were accountants, entertainers, maintenance mechanics and repairmen, and laundry and drycleaning operatives.

About 4 out of 5 workers in this major industry group performed service or management functions that may be aided, but not substituted for, by machines. Accordingly, technological change is not expected to have a significant impact on the industry's occupational structure through the mid-1970's. Clerical workers doing routine office tasks are among workers most likely to be affected by mechanical aids. The use of electronic data processing equipment and other types of office machines is now widespread in this industry and is expected to increase further. Technological developments will be a contributing factor in an expected decline in the proportion of service workers. For example, the increasing use of automatic dishwashing equipment, vegetable cutters and peelers, and other mechanical kitchen equipment will continue to limit requirements for kitchen helpers. Elevator operators will decrease as a proportion of total employment as self-service elevators are more widely used. On the other hand, an expanding population, traveling more frequently for both business and pleasure, is expected to create a greater demand for lodging facilities. The resulting employment gain should cause service occupations that represent relatively fixed labor costs (janitor, elevator operator, and detective, for instance) to decline relatively or grow more slowly than service occupations (maid, waiter, and waitress) which represent variable labor costs that are more closely associated with levels of room occupancy. Thus, the ratios of many variable cost service occupations will increase while the proportions of many fixed-cost occupations will decline. Craftsmen engaged in maintenance activities also will increase as a percentage of total employment. The ratio of mechanics and repairmen is expected to continue to grow as demands increase for skilled workers to cope with the rising maintenance requirements of modern facilities, such as air conditioning and swimming pools, now offered by many hotels and motels. Among professional workers, the trend towards chain and larger service oriented lodging facilities should increase the proportion of workers such as entertainers and recreation specialists.

Miscellaneous Business Services[120]

More than 1.2 million wage and salary workers were employed in the miscellaneous business services major industry group in March 1966. (See table 45.) About two-thirds were employed in "other business services" establishments.[121] Establishments furnishing services to buildings accounted for about 16 percent of total employment, and advertising establishments employed about 9 percent. The remaining workers were employed in establishments providing services such as consumer credit and mercantile reporting, and adjustment and collection.

Women workers accounted for 34 percent of total employment in miscellaneous business services in 1966. In the consumer credit reporting and collection agency

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[120] SIC 73. This major group includes establishments rendering services not elsewhere classified to business enterprises on a fee or contract basis.

[121] Includes the following industries: news syndicates; private employment agencies; duplicating, addressing, blueprinting, photocopying, mailing, mailing list, and stenographic services; and business services n.e.c. (establishments engaged in research, development, and testing on a commercial basis; business management and consulting and other business services, such as airplane rental, photographic developing, and fingerprinting.)

Table 45. Distribution of Wage and Salary Workers in the Miscellaneous Business Services Major Industry Group, by Industry, 1966

(In thousands)

SIC Code	Industry	Wage and salary workers		Women workers as percent of employment, by industry
		Number	Percent distribution	
73	Miscellaneous business services----------	1,220.2	100.0	34.1
731	Advertising--------------------------	111.9	9.2	39.2
732	Consumer credit reporting and collection agencies----------------------	68.4	5.6	71.5
734	Services to buildings-----------------	1/194.0	2/16.4	(3)
733, 5, 6, 9	Other business services---------------	1/810.3	2/68.5	(3)

1/ Benchmark data for March 1966.
2/ Based on March 1966, total employment in the major industry group.
3/ Data are not available.

Note: Individual items may not add to totals because of the inclusion of benchmark data and/or rounding.

industry sector, women workers represented about 72 percent of total employment, compared to 39 percent in advertising establishments.

Employment Trends and Outlook

Employment in the miscellaneous business services major industry group increased from 700,000 in 1959 to 1.2 million in 1966,[122] or by nearly three-fourths. During this period, employment more than doubled in the services to buildings group and increased by 90 percent in "other business service" industry group. Employment in credit bureaus and collecting agencies also expanded moderately (36 percent) over the 1959-66 period. In the advertising industry segment, employment grew much less rapidly–by only about 6 percent.

Employment trends varied within the rapidly growing other business services sector between 1959 and 1963. An estimated employment rise of two-thirds occurred in research and development laboratories in response to a general increase in research and development activity. Employment in business and management consulting firms also increased by about two-thirds, primarily because of the growing complexity of business operation. On the other hand, employment in news synidicates is believed to have declined slightly because, in part, of improvements in communications and transportation.

Manpower requirements in the miscellaneous business service major industry group are expected to rise from 1.2 million in 1966 to 1.8 million in 1975, an increase of about 50 percent. (See volume IV, appendix B.) This rapid rise of employment needs is expected mainly because of factors related to rising levels of business activity. For example, employment growth in establishments furnishing services to buildings is expected to be very rapid as a result of increases in the number of commercial buildings, and the trend towards contract services for window washing, floor waxing, office cleaning, and other janitorial services. Employment in consumer credit reporting and collection agencies also is expected to grow very rapidly as population and income rise.

Occupational Structure

Workers in the managerial and the professional occupational groups together accounted for about one-third of total employment[123] in the miscellaneous business services major industry group in 1960. (See volume IV, appendix G.) This high occupational concentration mirrored the relatively small size of establishments in this industry and the importance of specialized engineering, technical, and managerial services in research, development, and testing laboratories, and business and management consulting firms. To support the professional staffs, large numbers of clerical workers also were employed in this industry. Many of these clerical workers were employed in typical office occupations such as stenographers, secretaries, and typists, but many others were employed in clerical specialties such as media clerks, agents, and collectors.

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[122] BLS employment (payroll) data (benchmark) for all industry groups are not available for years prior to 1959.

[123] Including self-employed and unpaid family workers, as well as wage and salary workers.

Occupational structures differed substantially among the two sectors of the miscellaneous business services major industry group. The proportion of service workers was much higher in the other business services sector, due primarily to the greater demand for cleaning and maintenance workers in establishments providing services to buildings. Also, reflecting the greater diversity of services which it provides, the other business services sector used significantly larger proportions of most blue-collar occupations. The proportions of both managers, officials, and proprietors and sales workers were much larger in the advertising segment because of the particular nature of the services provided, the small firm size, and the importance of sales and promotional work in this industry.

Service workers, mainly guards and watchmen, and cleaning and janitorial personnel, represented about 1 out of 7 workers. Because of the personal nature of business services, craftsmen and operatives accounted for less than one-fifth of the industry's work force. Most operatives were in the residual "other" operative classification and performed various jobs ranging from placing advertising signs on public transit vehicles to exterminating household pests.

Because of the small size of establishments in this industry and the personal nature of the services rendered, technological innovations are not expected to have a significant impact on the industry's occupational structure during the next 10 years. However, the rapid growth of businesses providing electronic data processing services seems likely to cause some shifts within the industry's clerical occupational structure. Office machine operators are expected to increase their relative position at the expense of other clerical workers, some of whom perform routine jobs readily adaptable to ADP equipment. On balance, however, the ratio of clerical workers should increase slightly.

Despite the minimal effect of technology, other trends in the industry are expected to cause substantial shifts in the miscellaneous business service's occupational structure during the decade ahead. For instance, the proportion of professional and technical workers–particularly engineers and technicians–is expected to increase considerably as rising research and development expenditures by both business and government benefit firms that provide research, development, and testing facilities. On the other hand, managers, officials, and proprietors should decline relatively, primarily because of a sharp drop in the proportion of managers in the other business services sector, where the number of smaller firms is expected to be reduced by mergers and by a decrease in the number of new firms entering the businesses represented by this industry group.

Sign errectors and painters are among operatives and craftsmen in advertising who could be adversely affected by the trend restricting the use of out-door advertising.

Automobile Repair, Automobile Services, and Garages[124]

Current Employment

Wage and salary workers totaled about 335,000 in automobile repair, automobile services, and garages in March 1966. (See table 46.) Almost 4 out of 5 workers were employed in auto repair shops and establishments providing auto services such as inspection, washing, polishing, towing, and driving instruction. The remaining employment was about equally divided between auto parking and auto rental establishments.

Employment Trends and Outlook

Employment in automobile repair, automobile services, and garages increased from about 240,000 in March 1959 to more than 335,000 in March 1966, or approximately 40 percent.[125] Employment increased most rapidly–more than doubling–in auto rental establishments, mainly because of increases in business and pleasure travel which is accompanied by the growing practice of renting and leasing motor vehicles. The growing number and complexity of automobiles accounted for a combined one-third increase in employ-

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[124] SIC 75. This major group includes establishments primarily engaged in furnishing automobile repair, rental, and storage services to the general public.

[125] BLS employment (payroll) data for this major industry group are not available for the years prior to 1959 (benchmark data for March).

Table 46. Distribution of Wage and Salary Workers in the Automobile Repair, Automobile Services, and Garages Major Industry Group, by Industry, 1966

(In thousands)

SIC Code	Industry	Wage and salary workers	
		Number	Percent distribution
75	Automobile repair, services, and garages--------	1/334.5	2/100.0
751	Automobile rentals, without drivers-----------	1/ 40.5	2/ 12.1
752	Automobile parking----------------------------	1/ 36.4	2/ 10.9
753, 4	Automobile repair and services----------------	1/257.6	2/ 77.0

1/ Benchmark data for March 1966.

2/ Based on March 1966, total employment in the major industry group.

Note: Because of rounding, sums of individual items may not equal totals.

ment in the automobile repair and services industries. Between 1959 and 1965, automobile registrations increased from about 59.6 million to 75.0 million, or by 26 percent.[126] The trend toward increasingly complex automobiles accelerated during the late 1950's and early 1960's because of the growing popularity of equipment such as automatic transmissions, power steering, and air conditioning.

Employment in auto parking establishments increased only slightly–about 10 percent–between 1959 and 1966. This relatively slow rate of employment growth resulted from the rapid increase in the number of self-service parking lots and suburban shopping centers offering free parking.

Employment requirements in automobile repair, automobile services, and garages are expected to rise to 400,000 in 1975, an increase of nearly one-fifth. (See volume IV, appendix B) Employment growth will continue to respond primarily to the growing number and complexity of automobiles.

Employment in establishments renting automobiles is expected to increase by three-fourths between 1966 and 1975. The demand for rental automobiles will be stimulated by increases in business and pleasure travel. Air travel, a major factor in the demand for rental automobiles, is expected to grow at a rapid pace.

In the auto repair and services industries, employment is expected to grow moderately over the next decade. The increase will be less rapid than in the past due, in part, to the greater emphasis on replacement rather than repair of auto parts, and the introduction of extended maintenance warranties that tend to tie buyers of new automobiles to dealers for repair services. In addition, employment growth will be somewhat limited by increases in output per worker resulting from job and repair shop specialization and the growing use of laborsaving innovations such as dynamometers, engine analyzers, pneumatic wrenches, transmission jacks, and tire changers.

Despite an anticipated increase in the need for parking facilities, employment requirements in parking establishments is expected to grow slowly between 1966 and 1975. The continuing rapid increase in the number of self-service parking operations together with the popularity of shopping centers offering free parking will limit employment.

Occupational Structure

Reflecting the complex and custom nature of motor vehicle repair work, the automobile repair, automobile services, and garages major industry group has the highest proportion of skilled workers among the Nation's major industries (see volume IV, appendix G). In 1960, close to 3 out of 5 workers[127] in this major industry group were craftsmen or foremen, most of whom were motor vehicle mechanics. Operatives accounted for about 1 out of 8 workers, the largest proportion of them being auto service and parking attendants. Most of the remaining blue-collar workers were laborers such as car washers and tire changers.

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[126] Automobile Facts and Figures, *1966, Automobile Manufacturers Association, 1966. p. 18.*

[127] Including self-employed and unpaid family workers, as well as wage and salary workers.

Nearly two-thirds of the white-collar workers in this major industry group in 1960 were managerial personnel, reflecting the large number of small automobile repair shops. The proportion of professional and technical workers was very small, and most of these workers were teachers in establishments offering driver training.

Technological developments, shifts in the size of establishments, and growth pattern variations among industries are the major factors expected to cause a significant change in the industry's occupational structure over the decade ahead. The most significant change in the occupational structure is expected to be a decline in the relative position of craftsmen. One reason for this decline is the anticipated rapid growth in employment requirements for automobile rental agencies, which employ comparatively few mechanics and repairmen. In addition, the spreading use of power and special purpose tools and test equipment, such as dynamometers and engine analyzers, may adversely affect the employment growth of mechanics by reducing the time needed to diagnose malfunctions and check the quality of repairs. On the other hand, the relative position of diagnosticians and mechanic specialists could improve. Increasing output per mechanic resulting from the more widespread use of laborsaving devices and improved operating procedures will be offset to some extent by the greater complexity of automobiles. During the next decade, a growing proportion of automobiles is expected to be equipped with air conditioners, power steering, crankcase and exhaust emission control devices, and other items that add to maintenance requirements and the need for mechanics.

The proportion of managerial workers is likely to decrease over the decade ahead. Automobile repair establishments are expected to become increasingly larger, multiunit operations having more paid employees and relatively fewer managers. The proportion of owner-operated shops is expected to continue to decline. Conversely, the proportion of operatives is expected to increase moderately, mainly because of the anticipated rise in the average size of establishments specializing in operations such as parking services, where semiskilled workers account for a substantial share of total employment.

Miscellaneous Repair Services[128]

Current Employment

About 161,000 wage and salary workers were employed in the miscellaneous repair services major industry group in March 1966. (See table 47.) Almost one-third of all workers were employed in establishments primarily engaged in the repair of electrical equipment such as home appliances, television sets, radios, transformers, and electronic and electrical control equipment. The remaining workers were employed in "other" miscellaneous repair services.[129]

Employment Trends and Outlook

Employment in the miscellaneous repair services major industry group increased from about 124,000 in March 1959 to more than 161,000 in March 1966, or almost one-third.[130] Employment grew by one-fifth in electrical repair shops and by more than one-third in "other" miscellaneous repair services. Maintenance needs rose primarily from the growing stock of appliances, machinery, and other durable goods being utilized throughout the economy. In addition, much of the equipment also has increased in complexity, thus increasing labor requirements.

Manpower requirements in the miscellaneous repair services major industry group are expected to rise from 161,000 in March 1966 to 205,000 by 1975, an increase of more than one-fourth. (See volume IV, appendix B.) The increase in employment requirements will result from increasing consumer purchases of electrical goods, including portable and color televisions, stereophonic and transistor radios, video tape recorders, and household appliances, and rising business expenditures for capital goods.

Employment requirements in electrical repair shops are expected to grow moderately between 1966 and

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[128] SIC 76. This major group includes a miscellany of repair services performed by independent owner-operators or by very small shops.

[129] Includes bicylc, leather goods, musical instruments, farm machinery, business machine, reupholstery and furniture repair shops; typewriter rental shops; and establishments primarily engaged in the repair of watches, clocks, and jewelry.

[130] BLS employment (payroll) data (benchmark) are not available for this major industry group for the years prior to 1959.

Table 47. Distribution of Wage and Salary Workers in the Miscellaneous Repair Services Major Industry Group, by Industry, 1966

(In thousands)

SIC Code	Industry	Wage and salary workers	
		Number	Percent distribution
76	Miscellaneous repair services-------------------	1/161.2	2/100.0
762	Electrical repair shops-----------------------	1/ 51.0	2/ 31.6
763, 4, 9	Other miscellaneous repair services-----------	1/110.2	2/ 68.4

1/ Benchmark data for March 1966.
2/ Based on March 1966, total employment in the major industry group.

Note: Because of rounding, sums of individual items may not equal totals.

1975, or about 14 percent. The employment growth will reflect an increase in the number of electrical products in use such as radios, televisions, and phonographs; and home appliances such as electric can openers, waste disposals, and knife sharpeners. New consumer products, such as home video tape recorders, as well as improved styling and design of existing products, also will stimulate demand for repair services.

Employment requirements in "other" miscellaneous repair shops are expected to grow by more than 40 percent between 1966 and 1975. Increases in the rental and purchase of typewriters and various other business machines will stimulate demand for repairmen. In addition, growth in both the number and complexity of machines used on farms will increase requirements for farm equipment repairmen.

However, advances in technology, resulting in the manufacture of products that can be sold at prices competitive with the cost of repair, are expected to somewhat slow growth in employment requirements in this industry group.

Occupational Structure

Reflecting the high skill requirements of repair work, the craftsmen occupational group accounted for about three-fifths of all workers[131] in the miscellaneous repair services major industry group in 1960. (See volume IV, appendix G.) The vast majority of these craftsmen were mechanics and repairmen, nearly half of whom specialized in radio and television repairs. Other significant mechanic and repairmen jobs included motor vehicle mechanic, office machine mechanic, and other mechanics such as air conditioning and musical instrument repairmen. Operatives accounted for less than one-fifth of all employment in the industry. Welders and flame cutters utilized widely for structural repair work represented nearly half of the operative group.

White-collar workers, about half of whom were managers, officials, or proprietors, made up about one-fifth of total employment in this major industry group. The relatively high proportion of workers in the managerial group reflected the small size of most repair shops. The majority of miscellaneous repair services establishment have fewer than five employees; many are operated by proprietors having no employees. The small size of most of the establishments also is reflected in the relatively low proportion of clerical workers (6 percent).

During the next decade, technological innovations are not expected to significantly alter existing relationships among occupational segments in the miscellaneous repair services major industry group. Many of the services offered by this industry, such as watch repairing and reupholstering, are essentially performed by hand and are custom in nature. In addition, the small size of many repair shops tends to limit the extent to which labor-saving innovations can be introduced. Continuing increases in research and development activities should result in many new and improved products for both industry and the consumer. Although many of these products will be designed for more efficient repair, and some of them may be less expensive to replace than to repair, the growing number of products in use is expected to more than offset these inhibiting forces and cause a significant rise in the proportion of mechanics and repairmen. Within the mechanics and repairmen occupational group, the ratio of radio and television servicemen is expected to gain considerably because of anticipated strong consumer demands for electrical products such as color televisions, stereophonic radios and phonographs, and tape recorders.

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[131] Including self-employed and unpaid family workers as well as wage and salary workers.

Some skilled occupations, such as blacksmith and jeweler and watchmaker, should account for a smaller share of employment in this major industry by 1975. Welders and other metal workers will continue to displace blacksmiths in the competition for repairwork, while watch repairmen will be adversely affected by the increasing number of watches that can be sold at prices competitive with the cost of repairs. Few other significant changes are foreseen in the occupational structure of this major industry group, although a trend toward larger establishments seems likely to reduce the relative position of proporietors and raise the percentage of clerical workers.

Medical and Other Health Services[132]

Current Employment

Approximately 2.2 million wage and salary workers were employed in the medical and other health services major industry group in 1966. (See table 48.) About two-thirds worked in hospitals. The remaining workers were employed in establishments other than hospitals that provided medical services, including medical and dental laboratories; sanatoria, convalescent homes, and rest homes; offices of doctors, dentists, and optometrists; establishments of registered nurses engaged in independent practice; and associations providing medical or other health services to their members.

Women workers accounted for 79 percent of total employment in medical and other health service establishments in 1966. Women workers were more highly concentrated in hospitals than in nonhospital establishments.

Employment Trends and Outlook

Employment in medical and other health services establishments increased from nearly 1.4 million in 1958 to about 2.2 million in 1966, or by about three-fifths.[133] Factors affecting this growth were: expanding population, including an increasing proportion of very young and very old people who most need medical care; rising expenditures for medical care; expanding medical services resulting from new medical techniques and drugs; growing interest in preventive medicine and the rehabilitation of the handicapped; expanding medical research on the cause and prevention of physical and mental diseases; and the extension of medical insurance plans.

Employment in hospitals increased by more than one-half during the 1958-66 period, stimulated by such factors as a rise in the number of hospital beds and admissions; the rapid extension of hospital insurance programs; advances in medical technology as, for example, the introduction of electronic computer systems that automate blood testing and other complex electronic devices used in hospitals; and the expansion of the range and volume of services provided by hospitals.

Manpower requirements in the medical and other health services major industry group are expected to rise from about 2.2 million in 1966 to 3.4 million in 1975, an increase of more than one-half. (See volume IV, appendix B.) Manpower requirements will be stimulated by the same factors as in the recent past. In addition, the new Medicare program, provided by the Social Security Admendments of 1965, will enable more persons to receive medical care in hospitals and nursing homes. Additional workers will be required to staff the newly created community mental health centers currently being built under the Mental Retardation Facilities and Community Mental Health Centers Construction Act of 1963. Health workers will be needed to help staff the regional health centers provided by the Heart Disease, Cancer, and Stroke Admendments of 1965. More expenditures for medical research also will stimulate employment, particularly of professional and technical workers.

Employment in medical and health services outside of hospitals is expected to increase by about two-thirds during the 1966-75 period. This increase will result from continuation of many of the factors that stimulated past employment expansion in the medical and other health services major industry group as a whole.

Manpower requirements in hospitals are expected to increase by about three-fifths between 1966 and 1975.

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[132] SIC 80. This major group includes *private* establishments primarily engaged in furnishing medical, surgical, and other health services to persons.

[133] BLS employment (payroll) data for this major industry group are not available for years prior to 1958.

Table 48. Distribution of Wage and Salary Workers in the Medical and Other Health Services Major Industry Group, by Industry, 1966

(In thousands)

SIC Code	Industry	Wage and salary workers		Women workers as percent of employment, by industry
		Number	Percent distribution	
80	Medical and other health services	2,206.5	100.0	78.7
806	Hospitals	1,418.5	64.3	81.0
801, 2, 3, 4, 7, 9	Other health services	1/760.1	2/35.4	(3)

1/ Benchmark data for March 1966.
2/ Based on March 1966, total employment in the major industry group.
3/ Data are not available.

Note: Individual items may not add to totals because of the inclusion of benchmark data and/or rounding.

In addition to the employment growth expected as a result of the increasing demand for hospital care, increasing numbers of workers will be required to operate new and improved instruments such as electronic flowmeters that regulate the flow of human blood during heart-lung operations. Additional workers also will be needed to help develop and dispense newly discovered drugs such as antiblood-clotting agents, drugs that reduce high blood pressure, and new psycho-active drugs administered to mental patients. Furthermore, a continuing reduction in hours worked would require additional workers to maintain 24-hour hospital care. On the other hand, certain new developments in medical treatment, such as the use of antibiotics, will reduce the need for hospitalization or shorten the length of a patient's stay in a hospital. Because these treatment developments may reduce the amount of services provided per hospital patient, they may tend to moderate, to some degree, the growth in worker requirements resulting from growing demand and technological improvements.

Occupational Structure

As the center of all patient-care services, hospitals and many other organizations providing medical and health services have unique responsibilities. Their business is life and death, and the difference often rests upon the acumen of medical teams of inter-dependent professional specialists. More than 2 out of 5 workers[134] in this major industry group in 1960 was engaged in a professional, technical, or related occupation. (See volume IV, appendix G.) The personal nature of the services provided in the industry was evidenced by the very high concentration of nurses (representing about 40 percent of all professional workers and more than one-sixth of all workers), and physicians and surgeons. Other support workers widely utilized included medical and dental technicians, dentists, and chiropractors and therapists.

About 1 out of 3 persons in medical and other health services in 1960 was a service worker. The vast majority were attendants, practical nurses, or other auxiliary workers who contributed to the comfort and welfare of patients. Workers in the residual services group included kitchen workers, porters, and barbers. Clerical workers accounted for nearly 1 out of 6 persons in the work force. About one-third of the clerical workers were stenographers, typists, and secretaries. The ratio of managers, officials, and proprietors was not high, mainly because many hospitals and other medical and health service establishments employ administrators who are professional workers such as doctors or nurses.

Relatively few blue collar workers are employed in this industry, reflecting the service orientation of the industry.

The occupational structure differed somewhat among the two industry sectors. For example, ratios of professional and related workers were substantially higher in the other health services (except hospitals) sector than in

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[134] Including self-employed and unpaid family workers and government workers, as well as public and private wage and salary workers.

the hospitals sector. These differences were primarily attributable to significantly higher ratios of physicians, dentists, optometrists, and osteopaths in the other health services segment, where private practice predominated and support staffs are smaller. Likewise, the percentage of clerical workers also was highest in the other health services sector. This again reflected the tendency for establishments in this sector to be owned and operated by professional persons whose major employee needs were for clerical workers in secretarial, typing, and recordkeeping functions, and for such service workers as attendants and practical nurses.

During the decade ahead, changing technology and shifts in the nature of medical and health care are expected to be reflected in higher concentrations of both service and clerical workers, and reduced proportions of professional and technical workers.

Nearly every occupation among the professional, technical, and related workers group is expected to decline in relative importance by 1975, primarily because of increasing reliance upon nonprofessional personnel to support nurses and doctors, and to perform routine nontechnical duties. Technicians, however, are an important exception to this trend. The relative requirements for these workers will increase because of the expanding use of new and complex medical devices and techniques such as computer-controlled blood testing systems, physiological monitoring equipment, and hyperbaric pressure chambers.

Despite the general increase in the proportion of service workers expected by 1975, some jobs in this major occupational group may decline in relative importance. For instance, the growing use of disposable plastic and paper surgical gloves, caps, masks, hypodermic needles, and other hospital items is expected to temper needs for workers who perform laundry and sterilization duties. Furthermore, new hospitals will increasingly incorporate laborsaving innovations, such as new tray-assembly lines, that reduce the need for kitchen workers. The basic nature of health and medical care services will, however, continue to emphasize personal attention. As a result, anticipated employment growth among practical nurses, nurse aids, and hospital attendants is expected to more than offset lower labor requirements for some other service occupations.

Increases in the proportion of clerical workers are expected, resulting from the increasing needs for these workers in the more rapidly growing other health services industry grouping. This sector is composed of medical establishments that will be less likely to possess laborsaving office machines and computers. At the same time, record keeping requirements should increase together with the growing demand for medical services and the expansion of health insurance programs.

Educational Services[135]

Current Employment

About 968,000 wage and salary workers were employed in the educational services major industry group in 1966. (See table 49.) Nearly three-fifths of the workers in this major industry group worked in private colleges, universities, professional schools, and junior colleges. About one-third were employed in private elementary and secondary schools. The remaining workers were employed in libraries, correspondence and vocational schools, and specialized nondegree institutions such as dancing schools.

Women workers accounted for 45 percent of total employment in educational services establishments in 1966. Women workers were more highly concentrated in elementary and secondary schools than in private colleges and universities.

Employment Trends and Outlook

Employment in private educational services establishments increased from about 685,000 in 1958 to about 968,000 in 1966, an increase of more than two-fifths.[136]

The employment growth stemmed primarily from increasing school age population. The high birth rates of the 1940's brought an unprecedented expansion of elementary school enrollments in the early 1950's. By the mid-1950's, these children were beginning to enter high schools, and in the early 1960's, colleges were feeling the full impact of this population growth. Furthermore, the proportion of young people of high

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[135] SIC 82. This major group includes *private* establishments furnishing formal, academic or technical courses, correspondence schools, commercial and trade schools, and libraries.

[136] BLS employment (payroll) data for the major industry group are not available for years prior to 1958.

Table 49. Distribution of Wage and Salary Workers in the Educational Services Major Industry Group, by Industry, 1966

(In thousands)

SIC Code	Industry	Wage and salary workers		Women workers as percent of employment, by industry
		Number	Percent distribution	
82	Educational services----------------------	968.1	100.0	45.0
821	Elementary and secondary schools--------	325.9	33.7	57.2
822	Higher educational institutions---------	570.8	59.0	38.0
823, 4, 9	Other educational-----------------------	1/70.8	2/7.1	(3)

1/ Benchmark data for March 1966.
2/ Based on March 1966, total employment in the major industry group.
3/ Data are not available.

Note: Individual items may not add to totals because of the inclusions of benchmark data and/or rounding.

school age and college age who attend school has been steadily increasing.

Manpower requirements in the private educational services major industry group are expected to continue to grow to approximately 1.4 million in 1975, an increase of more than two-fifths. (See volume IV, appendix B.) Further expansion of the school age population and the rising proportion of persons remaining in school longer will generate most of the expected increase. Also, the greater availability of scholarships and loans will be a stimulus to greater enrollments in private schools of higher education. Moreover, the minimum age at which young people can leave school may be raised in some States. The ability to pay for education, resulting from the anticipated continued rise in family income, is another factor that will stimulate higher enrollments in educational institutions.

Occupational Structure

More than half of all workers[137] employed in the educational services major industry group in 1960 were teachers (see volume IV, appendix G), a majority of whom taught in elementary schools. The large number of teachers accounts for the industry's very high proportion of professional workers–more than two-thirds. Non-teaching professional occupations in the industry in 1960 included librarians, technicians, psychologists, nurses, artists, athletes, and entertainers. The residual other professional group was composed of such specialists as counselors and social and welfare workers.

Clerical workers accounted for about 1 out of 10 workers in this major industry group. About one-half of the clerical work force was made up of stenographers, secretaries, and typists. Most of the remaining clerical workers fell in the "other" clerical worker category, which included primarily library attendants and assistants, and teacher aides. Service workers accounted for nearly one-sixth of total employment. Many service workers are involved in school lunch programs or janitorial and cleaning activities, although other service workers, such as nursing school attendants, practical nurses, and watchmen, also are employed in substantial numbers.

Although technological innovations, such as educational television and teaching machines, are expected to be used increasingly in educational services during the next 10 years, their anticipated impact seems more likely to supplement the role of teachers rather than displace them. These devices should free teachers from many routine tasks, enabling them to spend more time in preparing lessons and teaching materials, and in giving assistance to individual students.

Nevertheless, changing teacher ratios will be the main effect of an anticipated shift in the occupational structure expected in educational services by 1975.

High post-World War II birth rates coupled with the growth in college attendance rates expected during the next decade will shift the area of most rapid school enrollment growth to the college level. This trend should raise the proportion of college teachers, and lower the proportions of both elementary and secondary school teachers. Overall, the percentage of teachers and professional workers as a group is expected to decline. Most of the decrease is expected mainly in the proportion of elementary school teachers (the largest professional group). This trend, to some extent, will result from the increasing use made of teacher's aides and professional specialists such as counselors.

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[137] Including self-employed and unpaid family and government workers, as well as private wage and salary workers, employed in educational services (SIC 82), and museums, art galleries, and botanical and zoological gardens (SIC 84).

A much higher percentage of clerical workers is foreseen by 1975. The largest increase in this occupational group appears in the clerical residual occupational group where teacher's aides are classified. The proportion of aides is expected to rise rapidly as a result of legislation passed in 1965 that makes available Federal funds for employment of these workers. Teacher's aides perform many clerical and nonprofessional duties previously assigned to teachers. Additional clerical workers also will be needed in occupations not significantly affected by advancing technology, such as stenographers and receptionists.

Among service workers, the higher proportion of cooks expected by 1975 will result from the expansion of lunch programs in many school systems. The relative position of managers and officials also is expected to rise in response to increasing numbers of institutions and physical facilities.

GOVERNMENT EMPLOYMENT[138]

Current Employment

Nearly 10.9 million wage and salary workers were employed in government in 1966. (See table 50.) More than half worked for local government; nearly one-fourth worked for the Federal Government; and one-fifth were employed in State government.

Employment Trends and Outlook

Total government employment nearly doubled between 1947 and 1966, increasing from 5.5 million to 10.9 million.

Between 1955 and 1966, the largest increase in government employment–about 85 percent–has been at the State level. This increase was due primary to the very rapid growth in educational activities. Employment in the local level of government also increased very rapidly by nearly three-fourths–between 1955 and 1966. Local government expansion also resulted primarily from the growth of educational needs. The increases in State and local government in functions other than education–60 percent and 54 percent, respectively–resulted from a growing, more urban population and the need to expand public health, sanitation, welfare, and protective services.

Federal Government employment increased by more than one-third between 1947 and 1966. Most of the growth in civilian employment between 1947 and 1955 was stimulated by the country's military commitments. Defense Department employment increased by nearly one-half, but since 1955, has remained relatively constant. Growth in Federal Government civilian employment in recent years has been due to the creation of new agencies and programs such as the National Aeronautics and Space Administration and the expanding functions of established agencies.

Manpower requirements in government are expected to increase from about 10.9 million to approximately 14.0 million between 1966 and 1975, or by over one-fourth. (See volume IV, appendix B.) Employment in State government is expected to increase most rapidly, by about three-fifths. Local government employment is expected to increase by more than two-fifths. Because of the continuing rapid rise in the population, and the resultant increased demand for services, sizeable growth in employment is expected in all major State and local government functions, including education, health and hospital care, sanitation, welfare, and protective services. Federal employment is expected to increase slightly between 1966 and 1975, by only 11 percent, barring major increases in our military commitments. Most of the anticipated increase is expected to result from growth in nondefense programs. Technological developments, such as automatic data processing, quick copy devices, data transmission and communications networks, and materials handling equipment, are expected to be a significant factor in limiting employment growth in government employment. Most of this impact will be felt at the Federal and State level where centralization of functions lend themselves to wider use of these developments. (For occupational distribution in public administration, see volume IV, appendix G.)

Table 50. Distribution of Wage and Salary Workers in Government, 1966

(In thousands)

SIC Code	Industry	Wage and salary workers	
		Number	Percent distribution
I	Government	10,871.0	100.0
91	Federal Government	2,564.0	23.6
92	State government	2,161.9	19.9
93	Local government	6,145.0	56.5

Note: Because of rounding, sums of individual items may not equal totals.

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[138] SIC Division I. This discussion includes all Federal, State, and local, and international government activities, such as the legislative, judicial, and administrative functions, as well as government-owned and operated business enterprises.

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